NASA TECHNICAL TRANSLATION NASA TT F-17045

HANDSHAKE IN SPACE
A SPECIAL PUBLICATION

Compiled by B. Konovalov and M. Rostarchuk

Edited by G. Ostroumov

Translation of "Rukopozhatiye v kosmose. Spetsial'nyy Vypusk," Moscow, "Izvestiya" Press, 1975, pp 1-480



(NASA-TT-F-17045) HANDSHAKE IN SPACE. A SPECIAL PUBLICATION (Joint Publications Research Service) 308 p HC $9.75 CSCL 22A

N76-32211

Unclas
G3/12 05258

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
WASHINGTON, D.C. 20546 August 1976

STANDARD TITLE PAGE

1. Report No. NASA TT F-17045	2. Government Accession No.	3. Recipient's Catalog No
4. Title and Subtitle "Rukopozhatiye v kosmose. Spetsial'nyy vypusk" [Handshake in Space. A Special Publication]		5. Report Date August 1976 6. Performing Organization Code
7. Author(s) B. Konovalov and M. Rostarchuk, compilers; G. Ostroumov, editor.		8. Performing Organization Report No. 10 Work Unit No. 11. Contract or Grant No.
9. Performing Organization Name and Address JPRS, 1000 North Glebe Road Arlington, Va. 22201		13. Type of Report and Period Covered Translation
12. Sponsoring Agency Name and Address National Aeronautics & Space Administration Washington, D.C. 20546		14. Sponsoring Agency Code

15 Supplementary Notes

Translation of "Rukopozhatiye v kosmose. Spetsial'nyy Vypusk," Moscow, "Izvestiya" Press, 1975, pp 1-480.

16 Abstract The joint Soviet-American space flight operation in July 1975, in which the Soviet spacecraft Soyuz-19 and the American Apollo rendezvoused in orbit, docked, and carried out various experiments and observations, was three years in preparation, requiring extensive and close interaction by both sides. Among other accomplishments the experiment successfully proved the feasibility of docking two space vehicles of different design while in space, for emergency, scientific, or practical purposes. The event was hailed for its revolutionary scientific, economic, and political significance.

17. Key Words (Selected by Author(s))	18. Distribution Statement Unlimited		
19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. of Pages 478	22. Price 75 kopeks

NASA-HQ

HANDSHAKE IN SPACE

Moscow RUKOPOZHATIYE V KOSMOSE - SPETSIAL'NYY VYPUSK [Handshake in Space - A Special Publication] in Russian, Moscow, "Izvestiya" Press, 1975, pp 1-480

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CHAPTER 1. CHRONICLE OF THE FIRST INTERNATIONAL FLIGHT

Good Wishes to Soviet and American Cosmonauts

On 15 July the leaders of the Communist Party and the Soviet government by direct television watched the launch of the Soviet spaceship Soyuz-19 from the Baykonur Space Port; it was placed in orbit to carry out docking and joint flight with the American spaceship Apollo.

Before the launch, the Soyuz-19 commander Hero of the Soviet Union Cosmonaut Pilot of the Soviet Union A. A. Leonov and flight engineer Hero of the Soviet Union Cosmonaut Pilot of the Soviet Union V. N. Kubasov reported to General Secretary of the CC CPSU Comrade L. I. Brezhnev that the ship's crew was completely ready to carry out the assigned joint flight task.

Comrade L. I. Brezhnev wishes the crew of the Soviet spaceship Soyuz-19 comrades A. A. Leonov and V. N. Kubasov a successful flight, successful completion of the mission, and safe return to their homeland.

L. I. Brezhnev also expresses wishes for a successful flight to the American spaceship Apollo and its crew Thomas Stafford, Vance Brand, and Donald Slayton.

The Soviet leaders express the hope that the joint flight will proceed successfully and demonstrate the potential which joint cooperation opens up in scientific space research.

Message from the President of the United States of America

The President of the United States of America Gerald Ford sent a message to the crews of the spaceships Soyuz and Apollo in which he emphasized that never before had the representatives of two countries lived and worked together in space. This is a historic event.

Your flight, the message states, represents a new stage in man's efforts to expand his knowledge of the world around him. It has already demonstrated something else -- the fact that the United States and the Soviet Union can cooperate in such a vital matter. Since agreement was reached three years ago on the Soyuz-Apollo flight, crew members, scientists, and specialists of both countries have been working diligently, productively, and in a spirit of cooperation in order to ensure the results that we have today. I am confident, the message concludes, that your efforts and your example will promote further cooperation between our countries. Gerald Ford wished the crews of the spaceships Soyuz and Apollo bon voyage and success. (TASS).

Greeting From Comrade L. I. Brezhnev to the Crews of the Soyuz-19 and Apollo Spaceships

To cosmonauts Aleksey Leonov, Valeriy Kubasov, Thomas Stafford, Vance Brand, Donald Slayton: on behalf of the Soviet people and myself personally I congratulate you on a remarkable event -- the first docking of the Soviet spaceship Soyuz-19 and the American spaceship Apollo.

The entire world is intently and excitedly watching your joint efforts to carry out the complex program of scientific experiments. The successful docking has confirmed the correctness of the technical decisions developed and implemented in creative cooperation by Soviet and American scientists, designers, and cosmonauts. We may say that the Soyuz-Apollo flight is the prototype of future international orbital stations.

Since the launch of the first artificial earth satellite and the first manned flight into outerspace, space has become an arena of international cooperation. The relaxation of tension and positive advances in Soviet-American relations have created conditions necessary for carrying out the first international space flight. New possibilities are being opened up for extensive, fruitful development of scientific ties between countries and peoples in the interest of peace and progress for all mankind.

To you, valorous conquerors of outerspace, has fallen the great honor of opening a new page in the history of the conquest of space. I wish you a successful completion of the program and a safe return to earth.
L. Brezhnev.

Message to the Cosmonauts From the President of the United States of America

Washington, 18 July. (TASS). After the successful docking of the Soyuz and the Apollo in space orbit, the United States President Gerald Ford went on the radio to greet the American and Soviet cosmonauts taking part in the joint flight.

The president expressed his enormous admiration for the difficult work done by the cosmonauts, congratulated them on the successful docking in space, and wished them a successful completion of the flight.

Your flight, he declared, is an extremely important event and a very substantial achievement not only for you five but also for thousands of American and Soviet scientists and technical specialists who worked together for three years to ensure the success of this historic and extremely fruitful experiment in the matter of international cooperation.

It has taken us many years to open the door to useful cooperation in space between our two countries. And I am convinced that the day is not far off when such space flights, which will become possible thanks to this first joint flight, will become common.

We are all hoping for your safe return, and we are following the success which you have already achieved with great interest, and we hope to have once more the opportunity to speak with you on earth when you complete your flight.

For the Sake of Human Progress

To the scientists, designers, engineers, technicians, and workers, to all collectives and organizations taking part in the preparation and implementation of the flight of the Soviet spaceship Soyuz-19 together with the United States spaceship Apollo.

To Soviet cosmonauts comrades Aleksey Arkhipovich Leonov and Valeriy Nikolayevich Kubasov.

Dear Comrades!

All mankind has been excitedly following your outstanding space experiment -- the joint flight of the Soviet ship Soyuz-19 and the American ship Apollo. For the first time in history the spaceships of two countries have docked, new methods of docking have been tested in operation for purposes of ensuring the safety of manned flights in outerspace, and astrophysical, medical-biological, technological, and geophysical experiments have been carried out.

The flight of the spaceships of the Soviet Union and the United States represents an important step in the development of Soviet-American scientific-technical cooperation. Its successful completion opens up new prospects for joint efforts by different countries in the peaceful conquest of outerspace.

Soviet science and technology is making an enormous contribution to this noble cause. Scientists, designers, engineers, technicians, and workers have marked the concluding year of the Ninth Five-Year Plan with new achievements in the further study and conquest of space. The work of the second crew of Soviet cosmonauts is proceeding successfully on board the orbital scientific station Salyut-4. Automatic space stations Venera-9 and Venera-10 have been launched toward the planet Venus. Investigations of the moon and the space around the moon are being conducted by the Luna-22 automatic station. Communications, meteorological, and other satellites are regularly being launched into outerspace in the interest of science and the national economy.

The Central Committee of the CPSU, the Presidium of the Supreme Soviet USSR, and the Council of Ministers USSR heartily congratulate you, dear comrades Aleksey Arkhipovich Leonov and Valeriy Nikolayevich Kubasov on flawlessly completing your country's mission. We also mention the expert skill of the American cosmonauts Thomas Stafford, Vance Brand, and Donald Slayton and your joint cooperative efforts.

We warmy congratulate the scientists, designers, engineers, technicians, workers, and specialists of the spaceport and the command-monitoring complex, all the collectives and organizations involved in the preparation and accomplishment of the flight of the spaceship Soyuz-19, the implementation of the Soviet program of the joint Soviet-American experiment. We wish all of you, dear comrades, great new achievements in the conquest of outerspace for the sake of a lasting peace on earth and the progress of mankind. L. Brezhnev, N. Podgornyy, A. Kosygin.

Nation's Mission Completed!

To the Central Committee of the CPSU, the Presidium of the Supreme Soviet USSR, and the Council of Ministers USSR.

We hereby report:

On 21 July 1975, after successful completion of the flight program, the re-entering spacecraft Soyuz-19 completed its landing in the target region of the Soviet Union.

To us fell the great honor of taking part in history's first joint flight of the spaceships of two countries -- the Soviet Union and the United States. In this space flight, so vital to the cause of peace and progress for all nations of the earth, we were inspired by the high praise of the work of scientists, designers, workers, and cosmonauts, and the warm words of greeting from Comrade L. I. Brezhnev.

During the flight, docking was accomplished for the first time between the Soviet spaceship Soyuz and the American spaceship Apollo. All of the systems, equipment, and scientific apparatus of the spaceship Soyuz-19 successfully completed the planned operations.

We heartily thank the Central Committee of the CPSU, the Presidium of the Supreme Soviet USSR, and the Council of Ministers USSR for the trust they placed in us.

The ship's crew is ready to carry out new assignments for the nation. Ship commander Leonov, flight engineer Kubasov.

To the Central Committee of the CPSU, the Presidium of the Supreme Soviet USSR, and the Council of Ministers USSR

We, the scientists, designers, engineers, technicians, workers, and cosmonauts who have taken part in the preparation and accomplishment of history's first international joint flight of the spaceships Soyuz-19 and Apollo, heartily thank the Central Committee of the CPSU, the Presidium of the Supreme Soviet USSR, and the Council of Ministers USSR for their great concern and attention to the work of our collectives and organizations, for their warm words of greeting and congratulation.

We are happy that our labor has been highly appreciated by our own Communist Party, by the government, and by Comrade Leonid Il ich Brezhnev personally, who are consistently and systematically implementing a policy of peace and relaxation of international tension. The docking in space is a brilliant and convincing example of the fact that it is fully possible to combine the efforts of the Soviet and American people to resolve crucial scientific-technical problems, and it serves the interests of all mankind.

The historic joint flight of spaceships of different continents opens up new horizons for space cooperation among all countries. We assure the Leninist Central Committee of the Communist Party of the Soviet Union, the Presidium of the Supreme Soviet USSR, and the Soviet government that we will continue to labor selflessly to carry out the responsible assignment of our country with respect to further investigation and conquest of outerspace.

To General Secretary of the Central Committee of the Communist Party of the Soviet Union Leonid I. Brezhnev

The Kremlin, Moscow.

Dear Mr. General Secretary,

I watched intently the progress of the Apollo and Soyuz flights. The successful docking of both spaceships and the scientific work carried

out by the crews during the period the ships were in docking position constituted the culminating moment of several years of intensive work and cooperation by dedicated people in both of our countries. They have every reason to be proud of their work.

This flight writes a new and exciting chapter in the history of man's space exploration. It proves that cooperation in space, incorporating the efforts and contribution of more than one country, is not only feasible but also desirable. I am confident that the example of the Apollo and Soyuz crews will be followed by others, and as a result an even greater contribution will be made to scientific knowledge and better international understanding. I am equally convinced that the Apollo-Soyuz flight is just the first step in a continuing American-Soviet cooperation in man's conquest of space.

Will you please convey my sincere congratulations to all who took part in the successful accomplishment of the flight -- especially Colonel Leonov and Mr. Kubasov. Their professional skills and expertise were exceptionally high. I await the opportunity to personally express my congratulations to them.

Again, please accept my warm congratulations on the occasion of the successful completion of the Soyuz flight. Respectfully, Gerald R. Ford.

Ukase of the Presidium of the Supreme Soviet USSR Awarding to Hero of the Soviet Union USSR Cosmonaut Pilot Comrade A. A. Leonov the Order of Lenin and the Second "Gold Star" Medal

For successful completion of the space flight on the Soviet ship Soyuz-19 jointly with the United States ship Apollo and for displaying bravery and heroism, Hero of the Soviet Union USSR Cosmonaut Pilot Comrade Aleksey Arkhipovich Leonov is awarded the Order of Lenin and a second "Gold Star" medal.

To commemorate the feat of Hero of the Soviet Union Comrade A. A. Leonov a bronze bust is to be erected in the hero's homeland. Chairman of the Presidium of the Supreme Soviet USSR N. Podgornyy, Secretary of the Presidium of the Supreme Soviet USSR M. Georgadze. The Kremlin, Moscow, 22 July 1975.

Conferring on USSR Cosmonaut Pilot A. A. Leonov the Military Rank of Major General of Aviation

The Council of Ministers USSR has decreed the conferring on Aleksey Arkhipovich Leonov of the military rank of major general.

Ukase of the Presidium of the Supreme Soviet USSR Awarding to Hero of the Soviet Union USSR Cosmonaut Pilot Comrade V. N. Kubasov the Order of Lenin and the Second "Gold Star" Medal

For successful completion of the space flight on the Soviet ship Soyuz-19 jointly with the United States ship Apollo and for displaying bravery and heroism, Hero of the Soviet Union USSR Cosmonaut Pilot Comrade Valeriy Nikolayevich Kubasov is awarded the Order of Lenin and a second "Gold Star" medal.

In commemoration of the feat of Hero of the Soviet Union Comrade V. N. Kubasov a bronze bust is to be erected in the hero's homeland. Chairman of the Presidium of the Supreme Soviet USSR N. Podgornyy, Secretary of the Presidium of the Supreme Soviet USSR M. Georgadze. The Kremlin, Moscow, 22 July 1975.

To the President of the United States of America Mr. Gerald Ford

The Whitehouse, Washington.

Dear Mr. President,

On the occasion of the successful completion of history's first joint flight and the docking of the Soviet spaceship Soyuz and the American spaceship Apollo I convey to you and to the people of the United States of America sincere congratulations on behalf of the Soviet people and myself personally. Will you also please convey our congratulations and best wishes to the brave American cosmonauts Thomas Stafford, Vance Brand, and Donald Slayton, and the American scientists, designers, specialists, and workers taking part in the preparation and the implementation of the Soyuz-Apollo program.

The flight of the spaceships Soyuz and Apollo, their docking in earth orbit, and the mutual exchange of crews resulted in the practical testing of the ships' compatible facilities, designed for purposes of improving the safety of manned flight in space, and they demonstrated the possibility of joint efforts in space by representatives of different countries. Constituting an important milestone in cooperation between the Soviet Union and the United States in the exploration and utilization of outer-space for peaceful purposes, the joint flight lays the groundwork for possible subsequent Soviet-American efforts in this sphere.

The success of this outstanding experiment was ensured by the flawless implementation by the Soviet and American crews of the complicated flight program; it was the result of the close and efficient interaction of our countries' scientists and specialists at all stages of preparation and implementation. The experiment represents a major scientific-technical achievement, opening up new paths toward the further conquest of space for the good of all mankind.

The flight of the Soyuz and Apollo is of historical significance as a symbol of the ongoing process of relaxation of international tension and improved Soviet-American relations on the basis of the principles of peaceful coexistence. At the same time it represents a practical contribution toward the further development of mutually beneficial cooperation between the Soviet Union and the United States in the interest of the peoples of both countries, in the interests of peace on earth. L. Brezhnev.

CHAPTER 2. ON THE ROAD TO COOPERATION

"The sides agreed to carry out efforts to develop compatible means for the approach and docking of Soviet and American manned spaceships and stations for purposes of improving the safety of manned flights in space and ensuring the possibility of carrying out future joint scientific experiments.

"The first experimental flight to test these facilities, which calls for the docking of a Soviet spaceship of the Soyuz type and an American spaceship of the Apollo type with mutual exchange of cosmonauts, is scheduled for 1975..." (From "Agreement Between the Union of Soviet Socialist Republics and the United States of America Concerning Cooperation in the Exploration and Utilization of Outerspace for Peaceful Purposes," signed in Moscow on 24 May 1972.)

In the Academy of Sciences USSR. Crews of Soviet Spaceships for the Joint Soyuz-Apollo Flight

In accordance with an agreement between the Soviet Union and the United States concerning cooperation in the exploration and utilization of outer-space for peaceful purposes, the crews of Soviet cosmonauts on the main and the backup Soyuz ships have been confirmed for the preparation and implementation in 1975 of a joint flight of a Soviet Soyuz two-man spaceship and an American spaceship, as follows: first crew -- USSR cosmonauts pilots and Heroes of the Soviet Union A. A. Leonov and V. N. Kubasov; second crew -- USSR cosmonauts pilots and Heroes of the Soviet Union A. V. Filipchenko and N. N. Rukavishnikov; third crew -- cosmonauts V. A. Dzhanibekov and B. D. Andreyev; fourth crew -- cosmonauts Yu. V. Romanenko and A. S. Ivanchenkov.

Below we present beief biographical information about the cosmonauts.

In March of 1965, Colonel Aleksey Arkhipovich Leonov during a flight in the spaceship Voskhod-2 was the first man ever to walk in space.

Valeriy Nikolayevich Kubasov in October 1969 made an orbital flight in the spaceship Soyuz-6 as a flight engineer.

Colonel Anatoliy Vasil'yevich Filipchenko in October 1969 took part in the group flight of three spaceships, serving as commander of the Soyuz-7.

Nikolay Nikolayevich Rukavishnikov in April 1971 made an orbital flight in the spaceship Soyuz-10, serving as test engineer.

Vladimir Aleksandrovich Dzhanibekov was born in 1942 in Yuzhno-Kazakhstanskaya Oblast. After graduating from the Higher Aviation Pilots School in 1965 he was awarded an engineer-pilots' diploma. In 1970 he was enrolled in a detachment of Soviet cosmonauts. Major V. A. Dzhanibekov underwent the complete course of general training for space flights and is taking part in work being done in accordance with the program of the joint flight of the Soyuz and Apollo spaceships.

Boris Dmitriyevich Andreyev was born in 1940 in Moscow. After graduating from the Moscow Higher Technical School imeni Bauman, from 1965 on he worked in a design bureau. He entered the cosmonaut training program in 1970. He underwent the course of general training for space flights and is taking part in work in accordance with the Soyuz-Apollo joint space flight program.

Yuriy Viktorovich Romanenko was born in 1944 in Orenburgskaya Oblast. In 1966 he graduated with honors from the Higher Aviation Pilots School and was awarded the engineer-pilots' diploma. In 1970 he was enrolled in a detachment of cosmonauts. Captain Yu. V. Romanenko underwent the complete course of general training for space flights and is taking part in work in accordance with the Soyuz-Apollo joint space flight program.

Aleksandr Sergeyevich Ivanchenkov was born in 1940 in the city of Ivanteyevka (Moskovskaya Oblast). After graduating from the Moscow Aviation Institute, starting in 1964 he worked in a design bureau. He enrolled in the cosmonaut training program starting in 1970. He underwent the complete course of training for space flight and is taking part in work in accordance with the Soyuz-Apollo joint space flight program. (TASS).

NASA Communique

The National Aeronautics and Space Administration (NASA) has announced the roster of the American crew which will take part in the joint flight with Soviet cosmonauts in 1975.

The commander of the American space crew is United States Airforce Brigadier General Thomas Stafford. Members of the crew are the present commander of the United States cosmonaut detachment Donald Slayton, and Vance Brand.

The 42-year-old T. Stafford is a veteran of space flights. T. Stafford made his first space flight in 1965 onboard the Gemini-6. In 1966 he made a flight onboard the Gemini-9. In 1969 Stafford was commander of the crew of Apollo-10, which flew around the moon.

D. Slayton, 49 years of age, will be the pilot of the docking module. This will be his first space flight. In 1962 he was to have made a flight on the second Mercury ship, but shortly before the flight he was removed for reasons of health. Only in March of last year did the medical commission certify D. Slayton as suitable for space flight.

V. Brand, pilot of the space module is 41 years old. Brand is a former Navy pilot. This will be his first space flight. V. Brand was in the backup crew of the Apollo-15.

The backup crew of the first joint flight in space consists of Alan Bean, Apollo-17 cosmonaut Ronald Evans, and Jack Lousma.

NASA also announced that the first joint training of American and Soviet space crews is being held this summer at the Houston Manned Space Flight Center in Texas, and in autumn of this year Soviet cosmonauts will receive their American colleagues in the Soviet Union.

Members of the main and backup crews have undertaken the intensive study of Russian. (30 January 1973).

Docking in Zvezdnyy

> Soviet cosmonauts and American astronauts have begun joint training in the town of Zvezdnyy for the Soyuz-Apollo program.

The first meeting of the full complement of both crews taking part in preparations for the joint flight of the Soyuz and Apollo took place on 19 November 1973 in snow-bound Zvezdnyy. When in the summer of this year our conmonauts were in Houston, two of the American astronauts were off on special assignment -- in space. Now they were all finally gathered together in the House of Culture in the town of Zvezdnyy.

In the huge hall the tables were arranged in a square letter U, the "legs" of which faced Soviet and American journalists. The American "team" sat to the left of us, the Soviet team to the right. In the center were the flight preparation officials; above them hung an enormous protrait of Yu. A. Gagarin, whose name has been given to the Cosmonaut Training Center in the town of Zvezdnyy.

V. Shatalov, twice Hero of the Soviet Union and director of the Soviet cosmonaut training introduces all the participants of this first meeting in Zvezdnyy to the journalists -- Center officials, specialists, and our own cosmonauts: veterans A. Leonov, V. Kubasov, A. Filipchenko, and N. Rukavishnikov, and newcomers V. Dzhankbekov, B. Andreyev, Yu. Romanenko, and A. Ivanchenkov. Then V. Shatalov discusses the American astronauts. The leader of the American astronaut group and the first crew, T. Stafford, has made two flights onboard Gemini ships and has flown around the moon onboard the Apollo-10. His crew companions are D. Slayton, one of the oldest American astronauts, and V. Brand, who has never before flown in space. A. Bean, commander of the second crew, was recently the commander of the second expedition on the American space station Skylab. Another member of the crew -- J.Lousma -- also took part in that flight. Their third companion, R. Evans, participated in the previous flight within the Apollo program.

A. Bean and J. Lousma look fine.

"Despite the fact that they recently spent 59 days in space," says V. Shatalov jokingly, "the cosmonauts have come to visit us without even going on leave."

The atmosphere of the meeting is relaxed.

The training period is scheduled for two weeks, until 2 December. The American astronauts will have to study the Soyuz and its basic systems, to become acquainted with the training devices used in the Soviet Union. The first working day will start today, immediately after our meeting. Talking about the program, T. Stafford incautiously remarked that "obviously it will not be very intensive." Right then the commander of our first crew innocently adds, showing a thick notebook containing the program, "I promise you will be busy from 0800 to 2100 hours. I do not know whether it will be intensive or not!" The Americans laugh outloud and Shatalov says with a smile that Leonov is just getting even with them for their intensive training program in Houston.

In the general discussion, Alan Bean adds his own warm words:

"I have been most pleased by the friendly mood of the Soviet cosmonauts and the excellent organization of the meeting and the upcoming program of training. We greatly desire to carry it out with the maximum return for our efforts."

V. Shatalov congratulates him, J. Lousma, and all the American participants in the meeting on the successful completion of the second Skylad expedition and the successful start of work on the third.

On behalf of all Americans, T. Stafford says:

"We are happy to arrive in Zvezdnyy and we are ready to begin training. I am sure we will work well together."

The training in Zvezdnyy has come to an end. Behind them are 10 days of intensive labor on the part of Soviet cosmonauts and American astronauts. And, rephrasing the familiar Russian proverb, we may say that this is one "pancake" which did not turn out a dud, even though it was the first one. Such was the feeling among journalists who on the evening of 29 November attended the meeting with participants of this stage of training for the Soyuz-Apollo project, a meeting which was opened and conducted by Academician B. Petrov, chairman of the Interkosmos Council.

"We are accumulating valuable experience in joint operations. The cosmonauts have learned the language well enough to understand one another. We are completely satisfied with the results of the work that has been done," remarked twice Hero of the Soviet Union V. Shatalov, the director of Soviet cosmonaut training.

His thought was corroborated by T. Stafford, leader of the American astronaut group: "This stage has been successfully completed. It is true that there is much more work to be done, but I do not foresee difficulties except perhaps for one thing," he added smiling. "After the expansive Russian hospitality we have gained so much weight that it will be necessary to increase the power of the booster rocket to place us in orbit."

An hour before this meeting we had seen how the American astronauts were "gaining weight." In the buffet room of the building where the cosmonauts were engaged in studies, a taste sampling of Soviet space dishes was arranged. During the Soyuz-Apollo space flight, after the docking, the cosmonauts and astronauts will move from one ship to another.

"We have the custom of entertaining our friends well when they come to visit. For this reason we want to treat you in advance in order to determine what you will like," says V. Shatalov.

Judging by how all of the astronauts devoured the tubes of borsch, kharcho soup, and green cabbage soup, how they relished the veal, the jellied tongue, the carbonated drinks, and the gingerbread, and toward the end laughingly toasted one another with tubes of black currant juice, the food of the Soviet cosmonauts was to their taste, and there is no doubt that meals onboard the Soyuz will be of top quality.

But however interesting it is to become acquainted with our cuisine, the main thing for the astronauts to do was become acquainted with the Soviet space equipment.

For the training, nine television films were made about the Soyuz ship and its systems, with the script in English. After the film was shown, a lecturer specializing in particular systems of the ship would give a more detailed explanation, answering questions flawlessly. During breaks, cartoon films were shown for relaxation. The guests especially liked "Wait a Minute!" and "The Musicians of Bremen." The journalists visited the classrooms and the astronaut's and cosmonaut's rooms in the new building in Zvezdnyy. The facilities are very convenient and comfortable.

The American astronauts became acquinated with our integrated Soyuz simulator, which can "duplicate" all stages of flight and any kind of situation. In it the cosmonaut can work as if in actual flight, except that there is no g factor or weightlessness.

In a meeting with journalists, cosmonaut N. Rukavishnikov said that our ship will not be changed drastically. The main difference with the Soyuz designed for the joint flight is the docking assembly itself. Formerly one part of the docking assembly was installed on the Soyuz and another was installed on the second ship or the Salyut. The Soyuz would thus play the role of the ship approaching the dock. Now, figuratively speaking, the two parts of the docking assembly are placed in a single system, and either one of the ships can be "active" or "passive." There are also some changes in a few other systems. In particular, the Soyuz is getting new antennas installed in order to permit radio conversations with the Apollo during flight.

The meeting with the Soviet and American journalists in the House of Culture in Zvezdnyy only lasted an hour, but IZVESTIYA was lucky enough to extend it -- we travelled to Moscow in a car together with the commander of our first crew Leonov, and Aleksey Arkhipovich filled us in on many interesting details.

Leonov said: "Our guests not only managed to work fruitfully but also to visit Kaluga, where Tsiolkovskiy lived and worked; they visited the ancient Russian cities of Vladimir and Suzdal', and they looked around Moscow."

On the road to Kaluga they saw our Russian winter in all its glory; in one place they asked to stop, and they played like children, throwing snowballs. In Houston, apparently, snow has fallen only once in the past 13 years, about 5 cm of it. It was an extraordinary occurrence -- it paralyzed traffic and the children did not go to school. And now this abundance of snow.

Our Zvezdnyy is a compact town; we live in high-rise 12-story buildings, whereas Houston, on the contrary, is spread out -- the astronauts live in one-story homes on small lots. As a rule, their families have more children then ours have, three or four apiece. But alas, like us, the astronauts have more girls than boys.

I should mention that all of the American astronauts treat us very kindly. They are good and sincere, very brave people and at the same time have a great sense of humor.

In Zvezdnyy we also had physical training. Playing on mixed teams, we played volleyball, basketball, and soccer, and we had firing range competitions. All of the American astronauts are in excellent physical training. Even A. Bean and J. Lousma, who spent 59 days in space, feel fine now. Especially Lousma, who is younger than Bean and is marvelously developed physically. They even passed the test of the Russian baths. They liked it, and the next time they asked for it themselves.

When we were leaving Houston, Ron Evans said: "So far I only know two Russian words, and I should like to propose a toast: 'For caravans of rockets.'" Today in the House of Culture we heard him wish for whole caravans of Soyuz's and Apollo's flying into space. This is an excellent wish.

The youngest of the American astronauts, J. Lousma, speaking to the journalists, expressed some words which drew applause, and I should like to end this reportage with his words:

"We have flown above your country many times, admiring its expanses from space -- the Black Sea, the Caspian Sea, Siberia, and Kamchatka. Now we are happy to visit your fine country. In July of 1975 the Souyz and Apollo will meet in orbit. But we can join not just our ships but also our countries, our great peoples, and work for peace on earth." B. Konovalov, special correspondent of IZVESTIYA.

Dress Rehearsal

Soyuz-16 in Orbit. TASS communique.

In accordance with the Soviet training program for the experimental joint flight of the space ships Soyuz(USSR) and Apollo (United States) on 2 December 1974 at 1230 hours Moscow time, the Soviet Union launched the spaceship Soyuz-16. The space ship is manned by a crew which includes the ship's commander Hero of the Soviet Union USSR Cosmonaut Pilot Colonel Anatoliy Vasil'yevich Filipchenko and flight engineer Hero of the Soviet Union USSR Cosmonaut Pilot Nikolay Nikolayevich Rukavishnikov.

The orbital flight program calls for tests of the on-board systems of the Soyuz, modernized in accordance with the requirements of the joint flight, also the implementation of scientific and scientific-technical research as well as observation and photographing of individual sections of the earth's surface for purposes of obtaining data to resolve national economy tasks. The Soyuz-16 ship is similar to the ship which is scheduled to take part in the Soviet-American experiment in 1975.

Constant radio and television communications are maintained with the Soyuz-16 crew.

Control of the Soyuz-16 space flight and the processing of incoming information is carried out by the Soviet Control Center by means of tracking stations located on Soviet territory and on scientific-research ships located in various regions of the world ocean.

The cosmonauts are in excellent condition. Conditions close to those on earth are maintained in the compartments of the ship.

Cosmonauts A. V. Filipchenko and N. N. Rukavishnikov have begun to carry out their scheduled flight program.

Soyuz-16 Commander Anatoliy Vasil'yevich Filipchenko

Hero of the Soviet Union USSR Cosmonaut Pilot Colonel Anatoliy Vasil'yevich Filipchenko was born on 26 February 1928 in the village of Davydovka (Voronezhskaya Oblast). After graduating from the seven-year school he worked as a machinist, studied in the Air Force School, and then enrolled in the Chuguyev Military Aviation School, from which he graduated with honors. Starting in 1951 A. V. Filipchenko served in air units of the Soviet Army, and in 1961 he graduated by correspondence from the Red Banner Air Force Academy (now known as imeni Yu. A. Gagarin).

A. V. Filipchenko has been a member of the CPSU since 1952.

In October 1965 he completed his first orbital space flight serving as the commander of the Soyuz-7. Since May of 1973 A. V. Filipchenko has been taking part in the training for the upcoming joint Soviet-American flight in accordance with the Soyuz-Apollo program.

Alatoliy Vasil'yevich is married. His wife, Yelizaveta Aleksandrovna, is a housewife. The Filipchenko family has two sons -- Aleksandr, born in 1957 and Igor', born in 1961. The cosmonaut's father died in 1955; his mother, Akulina Mikhaylovna, is retired, and lives in the city of Ostrogozhsk (Voronezhskaya Oblast).

Soyuz-16 Flight Engineer Nikolay Nikolayevich Rukavishnikov

Hero of the Soviet Union USSR Cosmonaut Pilot Nikolay Nikolayevich Rukavishnikov was born in 1932 in the city of Tomsk. In 1951 he graduated from high school, and in 1957 he graduated from the Moscow Physical Engineering Institute. After he graduated, N. N. Rukavishnikov worked in a design bureau, where he took active part in the handling of many engineering problems.

In 1967 Nikolay Nikolayevich was enrolled in the cosmonaut detachment. His first space flight was made in April 1971 on the Soyuz-10.

Since May of 1973 N. N. Rukavishnikov has been taking part in preparations for the upcoming joint Soviet-American flight within the Soyuz-Apollo program.

Nikolay Nikolayevich Rukavishnikov is a member of the CPSU.

Rukavishnikov's mother, Galina Ivanovna, is now retired; his stepfather died in 1962. The cosmonaut's wife, Nina Vasil'yevina, works in a machine building enterprise. The Rukavishnikov family has a son, Vladimir, born in 1965.

Soyuz-16: Mission Accomplished. TASS Communique

On 8 December 1974 after successfully completing the program of operations on board the Soyuz-16, cosmonauts comrades Anatoliy Vasil'yevich Filipchenko and Nikolay Nikolayevich Rukavishnikov returned to earth.

At 1104 hours Moscow time the re-entering spacecraft Soyuz-16 made a soft landing on the territory of the Soviet Union 300 km north of the city of Dzhezkazgan. The cosmonauts are in excellent condition.

During the course of the six-day orbital flight they carried out scheduled tests of a new docking assembly and its automated control system, guidance system, motion control system, and life support system; these were modernized in accordance with the requirements of the upcoming Soviet-American experiment in docking the space ships Soyuz and Apollo scheduled for 1975. While carrying out maneuvers, orientation, and stabilization of the Soyuz-16, the actions and working conditions of the crew were checked out while resolving tasks identical to tasks of the upcoming joint flight.

In accordance with the scheduled program, cosmonaut A. V. Filipchenko and N. N. Rukavishnikov carried out scientific and scientific-technical research, photographed various sections of the territory of the Soviet Union in the interest of the national economy.

During all stages of the flight, which took place under conditions maximally approximating the conditions of the upcoming space experiment, the Soyuz-16's systems and installed equipment operated normally.

Ukase of the Presidium of the Supreme Soviet USSR Awarding to Hero of the Soviet Union USSR Cosmonaut Pilot Comrade A. V. Filipchenko the Order of Lenin and the Second "Gold Star" Medal

For successful completion of an orbital flight onboard the space ship Soyuz-16 and for displaying bravery and heroism, Hero of the Soviet Union USSR Cosmonaut Pilot Comrade Anatoliy Vasil'yevich Filipchenko is hereby awarded the Order of Lenin and a second "Gold Star" medal.

In commemoration of the feat of Hero of the Soviet Union Comrade A. V. Filipchenko a bronze bust is to be erected in the hero's homeland. N. Podgornyy, chairman of the Presidium of the Supreme Soviet USSR, and M. Georgadze, secretary of the Presidium of the Supreme Soviet USSR. Moscow, The Kremlin, 11 December 1974.

Ukase of the Presidium of the Supreme Soviet USSR Awarding to Hero of the Soviet Union USSR Cosmonaut Pilot Comrade N. N. Rukavishnikov the Order of Lenin and the Second "Gold Star" Medal

For successful completion of an orbital flight onboard the space ship Soyuz-16 and displaying bravery and heroism, Hero of the Soviet Union USSR Cosmonaut Pilot Comrade Nikolay Nikolayevich Rukavishnikov is hereby awarded the Order of Lenin and a second "Gold Star" medal.

In commemoration of the feat of Hero of the Soviet Union Comrade N. N. Rukavishnikov a bronze bust is to be erected in the hero's homeland. N. Podgornyy, chairman of the Presidium of the Supreme Soviet USSR, and M. Georgadze, secretary of the Presidium of the Supreme Soviet USSR. Moscow, The Kremlin, 11 December 1974.

Testers

Transmitted from the spaceport by IZVESTIYA special correspondent.

One time I asked Nikolay Nikolayevich Rukavishnikov what he thought of most during his first space flight aboard Soyuz-10. One of his most exciting moments was the concluding session of the State Commission at the spaceport.

At that moment you suddenly understand absolutely clearly that that's it -- you already have one foot in space.

Outwardly nothing gives his excitement away. Perhaps just his slightly reddened cheeks and the excess haste with which he rises when they call out his surname. Filipchenko appears to be quite calm, and only his loud voice and his stammered phrases involuntarily reveal the storm of feelings raging within him.

The cosmonaut's profession combines elements of many others, but it is most like the trade of test pilot. It is true that in aviation, as a rule, one crew takes the craft through to series, whereas in the testing of space equipment the crews replace one another. This is understandable -- not only do the tasks of the flights change, the ships themselves substantially differ from one another, even if they are of a single series. In this flight the cosmonauts are to test a modified Soyuz which is designed to dock with the American Apollo ship.

The Soviet Union and the United States have planned their space equipment independently, and it is natural that the design and engineering solutions have been different. In the United States, the atmosphere of the ships is set at low pressure so that the structure can withstand it more easily in space and, consequently, strength requirements can be lowered and the weight of the crew's cabin decreased. So that the cosmonauts can breathe easily the atmosphere has been made of oxygen. By tradition this atmosphere has been maintained as well in the life support systems of later American ships, including the Apollo.

Our engineers, on the other hand, sought an optimum solution from the standpoint of comfort of the cosmonauts. They retained the nitrogen-oxygen atmosphere which is familiar to us all, under ordinary normal pressure. For this reason, it would have been impossible to "step" directly from the Soyuz into the Apollo -- that is, from 760 mm mercury column of nitrogen-oxygen atmosphere into 260 mm of pure oxygen atmosphere. The nitrogen dissolved in the blood might "boil" and its bubbles would clog the blood vessels. In order to make the transition safe, the cosmonauts would have been obliged to breathe pure oxygen for several hours. But time in orbit is costly, and for this reason the Soviet and American specialists decided on an "atmosphere compromise." They raised the pressure somewhat in the Apollo, and in the Soyuz, conversely, they reduced the pressure and increased the oxygen content to 40 percent. Now the transition from the Soyuz atmosphere to the Apollo atmosphere will be safe. This is one graphic example of a long chain of alterations which were made necessary by the space equipment docking task developed by the two countries separately. During this flight it will be necessary for the first time to test under space conditions a new docking assembly which will make it possible in the future, in times of danger, for ships from various countries to come to the aid of one another. They will test new radio technical devices for bringing the ships close together, antennas, receivers, and transmitters which will make it possible for the cosmonauts to talk with one another, with Moscow, and with Houston. Of course all of the new systems have been tested under earth conditions, but as is well known it is impossible to completely simulate space flight conditions on the ground. For this reason, in order to ensure complete success it is essential to make a preliminary test flight.

The job of conducting a kind of "rehearsal" of the future joint flight was entrusted to the second Soviet crew, out of four crews preparing for the Soyuz-Apollo program -- Heroes of the Soviet Union A. Filipchenko and N. Rukavishnikov.

Both of them are mature, experienced cosmonauts; they are superbly suited to the role of test pilots in this crucial flight. Anatoliy Vasil'yevich Filipchenko was commander of Soyuz-7 during the group flight of three Soviet space ships. Nikolay Nikolayevich Rukavishnikov saw earth from space onboard the Soyuz-10, when docking with the space station Salyut

was accomplished for the first time. These men are professionals for whom the conquest of space has become their life's work.

After the flight, Filipchenko in particular did not get a break in the preparation for new flights. Cutting short his leave, he became the backup for A. Nikolayev, when he was preparing for the Soyuz-9 flight. He trained in the Salyut program, and now in the Soyuz-Apollo program. This has been especially tough on him. He practically had to start learning English from scratch: previously he had studied German, French, and a very little English. When you consider also the fact that Filipchenko is one of the officials of our cosmonaut training it is easy to see that he has carried a considerable load during these years.

After the flight, Rukavishnikov had to do some hard work in the design bureau. The point of a test engineer's space flight is largely based on this subsequent work together with designers of various systems. A knowledgeable specialist who has witnessed the operation of the systems with his own eyes is a valuable supplement to telemetry data. After all, so far no automation can take the place of a man's mind, a man who perceives everything, so to speak, in flight, who is able to note the smallest details and subtleties, which may sometimes prove crucial.

During preparations for the Soyuz-Apollo program he, like Filipchenko, also had it tough under the "grind" of language training. But now they can speak fairly fluently in English. The main thing, however, is that they have learned to understand each other without words. According to the methodologists preparing the flight, they make a superb team, in which each understands his job magnificently.

In character they are similar to one another. Both are calm, well balanced, and considerate. One time Rukavishnikov said laughingly about himself: "I am the least famous of the cosmonauts." In fact, alongside V. Shatalov and A. Yeliseyev, with whom he flew on Soyuz-10, N. Rukavishnikov is not outwardly a very noticeable man: in size he is somewhat shorter, and people call him "curly head" only in jest. Evidently, his looks somehow unwittingly reflect his inner modesty and lack of desire to stand out.

"I highly appreciate modesty in people," said Filipchenko. "The modesty of a capable man. But modesty is worth nothing if that is one's only virtue. But if a man is an expert in his job but does not boast or strut, this means that he is worthy of respect."

It seems to me that with respect to this characteristic he especially singled out Slayton when we asked which of the American astronauts taking part in the preparations for the joint flight he found most likeable.

"He is the oldest one and holds a high post, and he trained as early as the Mercury flight, and yet he behaves exceptionally modestly."

Filipchenko himself, of course, is completely characterized by the quality which he values in others -- the modesty of an expert. He was an excellent pilot and he has become an outstanding cosmonaut.

Yesterday I watched while he and Rukavishnikov stood in the park near the Kosmonavt Hotel and silenty looked at the turbulen water of the river which had witnessed so many launches. I do not know what they were thinking about. Many cosmonauts say that when the pre-launch fever begins to abate, pictures of their own lives flash through their minds, and they think of their loved ones. Both men, as the American press puts it, have a "typically creditable biography" -- they are truly typical representatives of our people, of their generation.

Filipchenko says that he has a very strong recollection from childhood -- being bombed. He spent his childhood in war. The fascists for some reason bombed the hospital in Ostrogozhsk frequently. People hid in a cellar. Once they came out to find everything in flames, and their house destroyed by a direct hit.

Filipchenko went to work in a plant at the age of 15. Most of the people working there were young boys, like him, and women -- 10-hour shifts day and night, making parts for farm machinery and mines for the front. From those years he has retained enormous respect for the working collective, for the atmosphere of mutual aid and fairness.

In 1944 he entered the Voronezh Air Force School. The first post-was year. They slept on straw. Two-layer double bunks. About 15 men to a room. In the middle -- a small metal stove. Wood was hard to get. Sometimes the ink froze solid. But they studied hard. Those who came to study studied conscientiously.

Having received his diploma, he entered the Chuguyev School and became a fighter pilot. He served in various units of the Air Force.

He was to remember his first flight all his life. After a few advanced flying figures which the instructor made, Filipchenko suddenly caught himself with his hands grabbing onto the seat instead of the rudder. Although he was strapped in it seemed to him that he would surely fall out of the airplane. Now he remembers all this with a laugh. During his time of service there were many complicated, dangerous flights. He became an excellent pilot and earned the rank of test pilot.

On 4 October 1957, when word came of the launch of the first satellite, he had just come off some flights. When his friends began to tell him about this event, at first he did not believe them, thinking that they were kidding him because at the time many fantastic stories were being printed on the subject. But it turned out to be the truth.

On 12 April 1961 he was a student at the Red Banner Air Force Academy, which now bears the name of Gagarin. Studies were interrupted on that day of course. Everyone rushed to the radio. He was then 33 years old -- and he thought he might be a little too old to be a cosmonaut. But that turned out not to be so.

Nikolay Rukavishnikov also had a hungry wartime childhood. On 23 June 1941 he and several other children were running barefoot along a dusty road somewhere on the outskirts of Tomsk, when a somewhat older companion came and told them that the war had started. In school they had to write on newspapers -- they had no clean paper. In the wintertime they could see their breath. A children's cafeteria was opened in the city, where the children were fed once a day. All of his life he appreciated the pioneer camp where his mother sent him for the summers. There the children worked in the fields and "fattened up."

On 4 October 1957 Rukavishnikov was already an engineer in the design bureau headed by Sergey Pavlovich Korolev. His life's career was settled -- space equipment became his calling. Nevertheless, he was shaken by the news about the launch of the first satellite.

Rukavishnikov recalls: "I had the feeling that was as if I had glanced into another world. A kind of abyss opened up before me. It is hard to express in words, a very complex psychological feeling. It seems to me that my eyes had become extraordinarily opened, and that I was watching my own world -- the sky, the earth -- from some other place. I understood that there where this satellite flew there was no weather, no day or night."

On 12 April 1961 he was in the design bureau. When the voice of Levitan came with the words "The ship is piloted by Soviet citizen Major Yuriy Alekseyevich Gagarin" there was an explosion of joy in the room. All of them knew that the flight was being readied, and they were happy that it went off magnificently. Truly unbounded was the joy of all the workers in the enterprise when Gagarin himself went to see them -- to report, to show himself to those to whom he was indebted for being launched into the sky. A temporary speaker's stand was built in front of a garage with a round roof. Soon all of the space was filled to capacity and the roof began to fill up. Thousands of people came to this meeting with the first man ever to visit the world without weather.

Later on there came a day when he himself finally turned up in the town of Zvezdnyy. This was in 1967. He went there together with Vitaliy Sevast'yanov, who had given lectures before that in Zvezdnyy, knew everybody, said hello, and slapped them on the shoulder. In the cafeteria they were in the company of heroes, and Rukavishnikov became agitated and fearful that he might be there, as they say, without deserving to be. When they left, he turned on Sevast'yanov:

"Why did you drag me in there, Vitaliy; everyone in there is a Hero of the Soviet Union."

"Maybe you'll be a Hero yourself," Sevast'yanov said, calming him.

One time Filipchenko told me: "The main thing in life is to filfill one's duty. Always, under any circumstances."

Today their duty with respect to Rukavishnikov is to test the new model of the Soyuz space ship. And we may be assured that they will do a good job.

The famous bus carrying the cosmonauts is driven onto the concrete field of the launch area. Filipchenko, and right behind him Rukavishnikov, dressed in space suits, jump down onto the concrete and march, slightly bent, in these garments of sky-dwellers which are not very suitable for walking.

Embraces, hand clasps. The last embraces on earth. An elevator carries them to the top of the rocket.

At a pre-launch meeting with journalists we recalled the question which had become traditional in olden times: "How do you feel before a flight?"

"Most of all we are afraid to be afraid," said Filipchenko laughing loudly.

"At the airport we could sense how the doctors were "raging";flu is going around in Moscow, and after we flew in everyone had their temperatures taken, and the physician carefully examined all of those present. God forbid lest anyone pass on a virus in space. The experiment is too vital."

The cosmonauts disappear through the ship's hatch and we leave to go to the observation point.

On the Eve. Cosmonauts Anatoliy Filipchenko and Nikolay Rukavishikov Answer NEDELYA's Questions

[Question] What significance will the Soyuz-Apollo program within which your flight is taking place have for the development of cosmonautics?

Filipchenko: The first step in involving all countries in manned space flights was made when the United Nations passed a resolution on rescuing cosmonauts who were in trouble and had to make a forced landing on the territory of some country. Now the second step has been made -- methods are being worked out for rescuing cosmonauts directly in space. Undoubtedly this will be of great importance for involving new countries in the conquest of space and joint efforts of cosmonauts.

Rukavishnikov: The existence of long-term orbital stations is inconceivable without numerous dockings that are necessary to replace crews and deliver goods. In the future other countries will put up stations (not only United States and the Soviet Union), and the creation of international orbital laboratories is not far off. And, of course, the main task is to ensure their "compatibility" with each other, to standardize the docking assemblies so that when necessary the cosmonauts can come to the aid of one another or even simply interact with one another and exchange "scientific visits." It is just such principles of this future compatibility, approach mechanisms, docking facilities, and inside transfer that are now being worked out for the first time within the framework of the Soyuz-Apollo program.

Filipchenko: The preliminary flight is necessary in order to examine how well we have prepared the Soyuz for this work. It is a kind of rehearsal, a check-out of the ship under conditions that are as close as possible to next year's flight. In checking out the new docking assembly, for us a special docking ring will take the place of the Apollo ship. It will function exactly like the Apollo will function during the later stages of docking.

[Question] What did you do after the first flight?

Filipchenko: Right after the flight I was named to be the understudy for A. Nikolayev on the Soyuz-9. Then after a short time I "transferred" to the Soyuz-Apollo program. Parallel to this I performed certain duties with respect to the training of our cosmonauts.

Rukavishnikov: Three years went by. I worked in a design bureau and at the same time prepared for new flights. First on the astrophysical observatory program, which was implemented during the flight of Soyuz-13. Then on the Soyuz-Apollo program.

[Question] What was your strongest impression from the first flight.

Filipchenko: Like any man who has been in space I was enormously impressed by the astounding beauty of our planet seen from orbit. At the same time, an unforgettably acute developing sense of pride for mankind for managing to overcome earth's gravity.

Rukavishnikov: I recalled the session of the State Commission at which the crew was approved. I understood at that moment that now I had one foot in space. The re-entry produced a great impression on me. It took place at night, on the dark side of the earth; the separation of the re-entering craft took place in complete darkness, and it began to plunge into the atmosphere, and all that light, burning, and the roar of the rushing air produced a tremendous impression. As an engineer I was astonished at the smoothness of the operation of the whole automated system for landing the ship. The first phrase that I spoke back on earth was: "How smoothly the system operated!"

[Question] What are the difficulties of the present stage of preparation?

Filipchenko: For me it's the language barrier. At the age of 46 it is rather difficult to take up a foreign language. It's a serious matter, with the aim of conversing fluently. We not only have to know everyday conversational speech but also numerous special terms. After all, the Soviet crews have to carry on radio exchanges in English and the Americans have to speak in Russian. Everything else is familiar.

Rukavishnikov: Yes, a language should be learned at a young age, childhood is best. In terms of "technology" there have been no insurmountable difficulties. We were already familiar with the Soyuz and we know how to fly it. Although, of course, the training has been intensive, and every hour and every minute is scheduled; difficult training sessions. And sometimes, to put it frankly, you come out of the flight trainer dripping in sweat.

[Question] What do you like to do best?

Filipchenko: I am an avid hunter. I try not to miss hunting for ducks, forest game, and big game in the winter. I love to fish. Frequently my wife and sons and I go to the theater. It is true that now my oldest son has left our company -- he is enrolled in the Balashov Military Pilot School.

Rukavishnikov: I love books. Unfortunately, I don't have enough time. Only after you have gone through all kinds of medical examinations and observation can you read and think at your own pleasure. Until I joined the detachment I spent a lot of time with radio equipment, electronics; now I don't have time for that. I guess I have just one favorite occupation remaining -- bicycling, riding somewhere out of the city, about 20 or 30 miles. Recently, for example, I wanted to make a "great geographical discovery" by bicycle -- to find the sources of the Yauza. But I failed: there was nothing but scrub forests and swamps. So I'll never make a "great geographer."

[Question] Do you have a favorite place in our country?

Filipchenko: I love our town very much -- Ostrogozhsk, where I spent my childhood. It's about 90 km from Voronezh. I go there every year unfailingly; my mother lives there.

Rukavishnikov: I have many favorite places. The Black Sea enchanted me with its exotic scenery. I love the middle zone of Russia, especially during the springtime, in May. I love June. As for July -- it's hardly a summer month at all. Although it's hot, nevertheless everything is passed, you can sense autumn. I love Tomsk where I was born, and the country around it. This is natural, of course: every man loves the place where he spent his childhood.

[Question] What qualities do you value most highly in people?

Filipchenko: I like modest people. The modesty of people who genuinely know their job. There are modest people who have nothing behind it. This kind of modesty is no virtue. But if a man knows and can do many things but does not boast about it, does not strive to stress his superiority -- this is a valuable quality.

Rukavishnikov: A difficult question. Probably the people I like the best are those who see the world realistically, objectively, not on the basis of their own internal, subjective notions.

[Question] If you ever became stranded on an uninhabited island, who would you choose to play the role of your "man Friday?"

Filipchenko(laughing): Above all I would like Friday to be a woman. But seriously, I would choose a happy, talkative person. I myself am the silent type. Truly, the fighter pilot profession has left its mark on me. Up there you're flying alone -- all around the sky, no one to talk to. You need a sociable person in space.

Rukavishnikov: Our explorer of the Far East Arsen'yev had his own Friday -- Dersu Uzala; that's the kind of man I like. Incidentally, Darsu Uzala had a completely realistic view of the world and a realistic appraisal of his situation in the world and among others. You may recall that this episode takes place in the book: once they saw a comet, and Arsen'yev asked him:

"What do you think, Dersu; many people say that a comet means war or famine."

He answered:

"No. It travels constantly around the sky, and it does no harm to peole."

So you see, the value of a natural mind, gumption. Such a man is a valuable companion under difficult circumstances.

[Question] What do you value in your flight companion?

Rukavishnikov: Filipchenko is a technically well-versed person. Objective. He belongs to the category of people, very attractive to me, who think realistically, who are lucidly aware of their surroundings. I like him as a comrade, as a commander. I have known him many years, and we have never had any quarrels. Although we do argue frequently. Sometimes during training we interpret the essence of what is taking place differently. This is natural: a spaceship is a complex machine.

Filipchenko in my opinion is the best kind of commander -- sufficiently strict and at the same time considerate of the opinions of the others.

Filipchenko: Nikolay impresses me as an erudite specialist, modest, not given to empty words. We are similar to one another in character. It is pleasant to work with him.

[Question] If a wizard appeared right now, someone like Starik Khottabych, and said "I will grant you three wishes," what would you wish for?

Filipchenko: Our main desire now is to carry off the flight well, to check out all systems, and to give a good report to the specialists. And then... I would wish for my health to allow me to fly many more times in space, to continue to be an actual cosmonaut until the end of my days. But no doubt this is the common wish of all cosmonauts. Yet at my age a wizard's help would be fine. My third wish would be that my sons grow up to be genuine men, worthy of respect, no matter what career they choose in life.

Rukavishnikov: My first wish, of course, would be for our Soyuz-Apollo program to be completely successful. After that, to fulfill my dream -- to work as long as possible on board an orbital station. To live there two or three months and get accustomed to space. And, finally, I should like to know how things will be with mankind in 100 years on our "space ship" known as earth.

"Reconnaisance in Force." Transmitted From the Soyuz-16 Flight Control Center by Special IZVESTIYA Correspondent

A Green Point on the Map

The main hall of the Soyuz-16 flight control center reminds you of a theater. Only here the "stage" is taken up by an enormous world map. Dark continents, blue oceans. The color red outlines the territory of the Soviet Union, yellow designates the United States of America. The Soyuz-16 flight is a dress rehearsal of the future joint flight of the Soyuz and Apollo in July 1975. This is why these two space powers are distinguished on the map in our flight control center.

On the map there are a number of white circles outlining the earth-based tracking point -- zones of radio-visibility of the Soyuz-16 in those locations. The network of them covers the entire territory of the Soviet Union. Two circles outline ships which are floating control centers. Off the coast of Canada on the famous Newfoundland Bank there is the "Kosmonavt Yuriy Gagarin," and in the Caribbean Sea off the coast of Cuba there is the "Akademik Sergey Korolev." They maintain contact with our Center via the Molniya satellite.

The map not only designates the circles around our ground-based flight tracking centers but also those around the American tracking centers scattered throughout the world -- in Australia, the island of Madagascar, Spain, and South America. These are dotted-line circles. The American ground-based stations on this flight will function as "observers." There is no Apollo so far above the planet. But for the American specialists as well this flight is a rehearsal of the future operations. And they are processing data concerning the trajectory measurements of the Soyuz-16 in order to place the Apollo in rendevous orbit and to help the American cosmonauts with advice during the approach.

The Apollo must be launched 7.5 hours after the Soyuz goes into orbit. But before that the Soviet side must give its O.K. to launch. The Soyuz crew must check the functioning of all systems on their ship, and control center specialists will use electronic computers to determine the orbit with absolute accuracy and provide the cosmonauts with data necessary to correct it.

A. Filipchenko and N. Rukavishnikov went right to work after going into orbit, without a hitch, as the saying goes. Everything was working normally on the ship, the solar batteries were opened up, communications were functioning, and all service systems were functioning normally. After pinpointing the trajectory measurements from earth the cosmonauts corrected the orbit and made it as convenient as possible for the rendevous with the Apollo, simultaneously checking the control system and the operation of the ship's engines. After that the provisional go-ahead was given for the Apollo launch.

On one of the display boards of the main control room, arranged in a semi-circle above the "stage" right under the ceiling, was the lighted sign: Apollo...A Loop...Systems Equipped... As yet the space showing the parameters of Apollo is empty. But next year this display board will show data concerning the course of its flight.

At the spaceport the Soyuz-16 was rapidly changing in form. First of all it was an enormous rocket with a blinding white ball of flame from the roaring engines, then a fire-red aircraft plunging into the blue sky, leaving behind an enormous inverted wake, and finally just a large, gradually dimming star. Here in the control center, Soyuz-16 always looks the same -- a large green point moving along a yellow line similar to a sinusoid.

The "stage" in the main room is divided into three parts. To the left of the map on which the movement of Soyuz-16 can be seen, on an electronic display board one can see data about when the ship will enter the zone of visibility of each tracking station, when it will leave the zone, and to the right on a screen one can see data concerning the operation of the various systems of the ship, the program of each loop, and any adverse remarks on the functioning of the preceding one.

Now as I am writing these lines I can read: "Program of loop No 16 completed. No adverse remarks on the condition of the crew's health."

We are watching the screen from a balcony. On the floor of the main room there are five long rows of panels with specialists on the various systems of the ship, operators communicating with the crew, and flight officials. This is a "collective brain," which although it is far away from earth's two emissaries, it is working in unison with them and for them. It is good to know that A. Filipchenko and N. Rukavishnikov feel fine and they are capable of doing their work. After all, they are working in circumstances which are different from those under which Soviet cosmonauts have worked until now. On 2 December they reduced the pressure in the ship to 540 mm. This was done to simulate the ability to transfer to the Apollo's atmosphere without an "acclimatization period." At the same time, the oxygen content in the atmosphere was raised to 40 percent. It makes no difference to the cosmonauts because, despite the more rarified air, overall because of the higher percentage of oxygen the organism gets just as much as in ordinary conditions. But to the operation of the life support system it does matter. It has been made different from ordinary Soyuz's and is now undergoing checking.

The screen now shows the program of the next loop of the flight. At the end is written: "Preparation to execute maneuvers to form link-up orbit" -- the same orbit in which the Soyuz and Apollo will dock. That will be in July of next year. So far -- this is a dress rehearsal.

In Link-Up Orbit

The green dot representing Soyuz-16 on the screen of the main room of the control center slowly approached the coast of Argentina. There over the Atlantic Ocean the commander of Soyuz-16 A. Filipchenko was scheduled to turn on the ship's rocket engine in order to begin to shift it to the so-called link-up orbit most favorable for docking with the Apollo. Next year, evidently, A. Leonov and V. Kubasov would be working in that orbit. Leonov already estimated that only a little time remained:

"Just seven months and 12 days," he said.

He and Kubasov were here, in the main room, observing the rehearsal of their flight. I asked Valeriy Kubasov, a specialist in celestial mechanics and trajectory computations, to comment on what was taking place in the sky over the Atlantic.

Kubasov said: "Now the Soyuz-16 is in an elliptical orbit -- with an apogee of 240 km over the surface of the earth and a perigee of 190 km, and it will have to be made into a circular orbit. This is done in two ways. In order to increase the perigee in the upper point, the acceleration engine is turned on. The ship begins to move in the circle of the larger radius and at the lower point reaches a greater height above earth. In order to lower the apogee, conversely, the braking engine is turned on at the lower point. Then the ship begins to move in the circle of the smaller radius and at the lower point reaches the lower height above the planet. This is just a rough idea of what takes place in space. In order to issue recommendations for carrying out such an orbital corrective by means of two engine switch-ons that are separate in time, the ground-based center has to do a lot of work."

We took a short excursion through the enormous building of the control center, which is literally stuffed with the latest electronics equiment and modern communications lines. The coordination-computer center is linked to all ground-based tracking stations, with Central Television, and with the back-up computer center. Communications with the Far Eastern stations and ocean-going ships of the space fleet are maintained via satellite.

Two BESM-6 computers with an operating speed of one million operations per second do the calculations for the ballistics group and the telemetry operators. A special conjugated system which is no less complicated than the computers themselves makes it possible to automatically feed data coming in over the communications lines into the electronic computers as fast as they are received, and to feed the process results into the communications systems and onto the screens of all the services in the control center.

The data received during the Soyuz flight above our stations immediately lit up in front of the shift on duty in the main room of the center and in the numerous rooms of support groups. Earth could immediately see, for example, how well the operations were going in the life support system,the heat regulation system, the power supply system, the guidance system, and the motion control system. Hundreds of parameters showing the status of all shift systems and even the health condition of the crew could be continuously controlled on earth by means of the "electronic brain," and specialists received information necessary for giving recommendations to the crew.

Before executing the corrective, the Soyuz-16 crew received a precise directive on how to turn the ship, at what point to turn on the engine, and how long to operate it. Now the Soyuz-16 was approaching the target region. The green dot on the trajectory line was merging with the red dot, and then it slowly detached itself from it.

Flight engineer N. Rukavishnikov reported: "The maneuver is complete. The engine operated for 12 seconds."

Then over the voice communications line came the report of the second engine switch-on. Now the orbit of Soyuz-16 became practically circular.

During flight, A. Filpchenko and N. Rukavishnikov are executing an extensive program of scientific, technical, and national-economy experiments. In particular, all of the biological experiments of the program had begun. There were five in all. Two of them would be carried out as well by the American crew in July of the next year during the joint Soyuz-Apollo flight. They involved an investigation of the make-up of microorganisms in the ships before and after the exchange visits of the cosmonauts, and an experiment with so-called zone-forming fungi. Everyone has probably seen the annual growth rings on cross-sections of tree trunks. There are very simple organisms -- antinomicetes -- which during their growth form similar rings, except that the process does not take a year but just one day. Since the periodicity of their growth has been well studied, it is very simple to find out how the life rhythm of these organisms will vary under space conditions. In particular, biologists are very interested in the effect of heavy particles that occur in cosmic rays.

For the experiment, the Pushchino Biology Center made a special instrument known as Ritm. In it the fungi are nourished on a gelatin medium made of algae. After going into orbit, three times a day the cosmonauts photograph what is taking place in the instrument.

A special dosimeter records the particles that hit the instrument and determines their energy.

In July of the next year the Ritm will begin to operate at various points above the earth onboard the Soyuz and Apollo; after docking, the instruments will be in identical condition, and during the concluding stage of the flight they will again be in different conditions. A comparison of the results will be of great interest to scientists.

On the screen of the Center the program of the next loop appears. Now begins one of the most interesting moments in the rehearsal of next year's flight. The docking with Apollo will be simulated.

Soyuz Goes Into "Docking"

"Buran, this is Zarya, come in," thus begins each session in the flight control center.

"Buran" is the nickname of the Soyuz-16 crew. It was A. Filipchenko's nickname when he was the commander on Soyuz-7, and in accordance with the tradition it has stuck to him, while N. Rukavishnikov on this flight is known as Buran-2.

When during the communications session during the 35th loop of Soyuz-16 Zarya asked Buran to record the entire time necessary to unpack the spacesuits and put them on -- that is, the net time it took for the cosmonauts to put on their uniforms -- we knew that preparations were underway for the simulated docking with Apollo.

The cosmonauts put on their spacesuits and transferred to the re-entry vehicle and closed the hatch connecting that compartment with the orbital compartment.

The Soyuz turned its docking assembly in a position to simulate rendevous with the Apollo and flew in orbit with the engine nozzle forward; light beacons were turned on along with a special target to help the American cosmonauts seek out Soyuz and to facilitate the docking maneuver.

On the next loop Rukavishnikov reported:

"We have executed a 60-degree turn."

The Soyuz-16 crew simulated preparations for the first docking with Apollo. Prior to that the Soyuz had to turn 60 degrees around its longitudinal axis and fly in that position until docking. This is done at the request of the American side. The Apollo will also turn 60 degrees so that its antennas can maintain communications with earth via an American satellite.

Of course, it is impossible to simulate the entire docking process during the flight of one ship; for this reason our specialists decided to check the functioning of the mechanisms, the elements of the docking assembly, and the automation system under conditions as close as possible to those of the future flight.

The docking assembly, which will be finally tested during the Soyuz-Apollo flight is unique. Until now, both the Soviet and American ships made use of the "pin and clutch" system. The docking assembly was divided into two parts, one of which -- the "pin" -- was located on the active ship performing the maneuvers of approach and docking, while the second part -- the "clutch" -- was installed on the passive shop. Now it has been decided to make the docking assembly universal so that either of the docking ships can play either the passive or active role. This is of

considerable importance to any ship that is in trouble. This assembly has come to be known as the androgynous peripheral docking assembly. The word "androgynous" means "bisexual," and it exactly reflects this ability of the assembly to play either the passive or active role. The word "peripheral" means that the series of docking system mechanisms, including the guide projections, the dampers, and the latches by means of which the ships are grappled, stabilized, and brought together, are located not in the center of the docking assembly (as in the case of the "pin and clutch" system), but rather on the periphery, and are distributed around a special ring. The center of the assembly in this case can be used conveniently as a hatch through which the crews can move from ship to ship.

During the joint flight in July of 1975 two dockings will take place. During the first, the active docking assembly role will be played by the Apollo; during the second, the Soyuz. The ship with the active assembly makes the approach, having thrust the docking ring forward. From the docking ring, cone-shaped projections stick out like petals; they serve as guides during the docking. The docking ring of the other ship has the same kind of petals. During the docking, the petals of the one assembly must fit into the interspaces of the other, forming a kind of six-petal "daisy." During the process the latches are to be actuated, in function resembling a padlock, to effect a preliminary coupling in such a fashion that the ships can no longer rotate with respect to one another. During this process, special hooks located on the docking frame (there are eight in all) are to engage the hooks of the other ship. By means of them, firm coupling and sealing of the ships' docking mechanisms is ensured.

The Soyuz-16 now went into orbit as if in docked condition. A special ring simulating the docking surface of the Apollo was clamped with a force of more than 10 tons to the Soyuz-16 docking assembly. On the flight, A. Filipchenko and N. Rukavishnikov tried and tried to move the docking ring, the simulator ring, and they checked the functioning of all the wires, the automation logic, and the functioning of the hooks. In short, a "reconnaisancein force" was completed.

The tests showed that the docking assembly and its automation system were functioning perfectly. The Soyuz was ready to dock with Apollo.

Soon, the Final Lap

On the morning of 7 December, the map in the main room of the Soyuz-16 flight control center showed the representation of yet another red ship. To the ships "Kosmonavt Yuriy Gagarin" and "Adademik Sergey Korolev" was added the vessel "Morzhovets." This ship went out into the South Atlantic in order to take telemetry information from Soyuz-16 when it was about to descend. The final lap of the flight was approaching. The cosmonauts were already tuning in to "earth's wavelengths." A. Filipchenko was curious about how the weather was down here. The answer from earth: "A real Russian winter." "That good; up here we get the feeling that our planet has only water and clouds," said A. Filipchenko.

During a routine testing of a color television camera, N. Rukavishnikov placed beside him a red pennant and a picture of his nine-year-old son which he had drawn when he said goodbye. Obviously the cosmonauts were already anticipating the joy of reunion with their relatives and friends on earth.

During the 80th loop, the crew above the Atlantic made a test switch-on of the engine to test its functioning just before the upcoming return to earth. The "Morzhovets" recorded the turning on and turning off of the engine, which operated for 14 sec. The Soyuz-16 came out of the circular orbit in which it was to dock with the Apollo the following year. Its orbit again became elliptical.

The program of scientific experiments was gradually becoming completed. Candidate of Biological Sciences Aleksandr Semenovich Kamin reported that the cosmonauts had, by means of preservative, already fixated the sprouted seeds of crepis and arabidopsis, which are rapidly developing plants which are well known to geneticists. On earth these sprouts, already having undergone the first cycle of cell division, would be carefully studied and specialists would see what changes space conditions would make in genetic processes.

The microbes continue to grow in an intrument which resembles a labyrinth filled with nutrient. As growth proceeds, the medium becomes filled with a microbe mass that is violet in color. By the change in the color the cosmonauts can see graphically how the microbes grow. During the first days the microbes developed hardly at all. Now they have already become accustomed to the unusual conditions.

"But microbes adapt less quickly than we do to weightlessness," said N. Rukavishnikov slyly during one of the sessions.

Before the launch of Soyuz-16 itself, fertilized fish eggs were placed in an on-board aquarium. Now, small fish have hatched. On the last day of the flight they will be fixed in a preservative in order to thoroughly study them on earth. The object of this experiment is to determine how the lack of gravity affects the development of earth organisms. For fish, gravity is an important factor enabling them to freely orient themselves spatially.

A. Kamin says: "We are extremely interested in watching what will happen to the gravity-sensing organs in young fish that have been hatched in weightlessness."

The scientists are getting ready to take advantage of the unique potential of the joint flight of two ships in July of next year. In particular, an experiment is being readied involving so called microbe exchange. Any human being lives in conjunction with an enormous quantity of microorganisms which live in his organism and in the environment. On this flight the cosmonauts have taken a number of microorganism samples from various places on the ship, from each other, and from their hair and skin, fixing them by means of pads saturated in preservative.

Next year the cosmonauts will take samples on the Soyuz and the Apollo prior to docking and after passing from ship to ship. This experiment will to some extent make it possible to determine how dangerous it may be in the future for cosmonauts to "go visiting" when working in long-term orbital stations.

Another experiment which will take advantage of the joint flight is astrophysical in character. The Apollo will serve for a short time as an artificial moon for the Soyuz. The Apollo will block off the sun, and the Soviet cosmonauts will be able to observe an artificial solar eclipse through a porthole in the passage hatch. The Soyuz crew will be able to photograph this interesting phenomenon. And the American astronauts on the Apollo will be able to film the shadow of their ship passing over the Soyuz.

This photographing will make it possible as well to capture on film the aureole of particles which form around the ships because of the fact that gases are released from the design materials and dust motes form from the gradual disintegration of the coatings.

On this flight the cosmonauts have investigated the transparency of the portholes through which the photographing will be done; they have photographed the sky of space and earth's horizon. This is necessary, in particular, to determine how earth's background illumination will affect the photographing of the artificial solar eclipse.

At the same time the crew of Soyuz-16 has reported that they can observe shining dust particles. And on the morning of 7 December, Rukavishnikov said that they were observing very large particles.

"It's like we were flying through nuts and bolts," he joked.

On the 82nd orbit the cosmonauts jettisoned the ring simulating the hookup with Apollo. Exploding charges freed the locks of the docking assembly, and spring-loaded pushrods ejected the ring into space, thereby simulating the undocking maneuver with Apollo. The maneuver was a success. Now, the Soyuz -- free of the Apollo -- is preparing to return to earth.

Excellent, Buran

Usually on the screens of the control center two yellow lines are designated on the map showing the trajectory of the Soyuz-16 flight; they are similar to sinusoids -- the current orbit and the next one. Just one line remains now. This is the last (the 96th) flight orbit -- the landing orbit. Once more the map, as on the morning of the day before, shows the silhouetted image of the diesel ship "Morzhovets," which has gone out to the vicinity of Voznesenive Island in order to take telemetric information during reentry. Just below it -- an orange colored spot -- is the calculated place of switching on the braking engine; above it is another spot where the engine is to be switched off. The same kind of orange spot over Africa marks the place where the reentry capsule is to be separated.

On the morning of the day before, 7 December, Filipchenko and Rukavishnikov carried out a trial switch-on of the engine over the Atlantic and a rehearsal of their actions during reentry. This proved to be extremely useful. It turned out that it would be very difficult for the cosmonauts to orient the spacecraft over Africa relying on sight alone instead of instruments as is customary: the barren land there showed absolutely now contrasts.

"There are no clouds," reported N. Rukavishnikov on the previous orbit. "Level brown soil and haze. No outstanding landmarks."

A. Filipchenko says: "It's a good thing we already flew over this and noticed it: we began to orient the spacecraft earlier than was planned. In the future it will be necessary to take this into account without fail."

"We will, we will," answered V. Shatalov on earth, training manager of the Soviet cosmonauts, who was in communication all the while. "We will send Leonov to Africa beforehand to sketch all of the deserts in order to orient the spacecraft more efficiently," he adds jokingly. "Don't worry, Buran, everything was fine; everyone is very happy with your work. We are convinced that the last stage of the project will also be o.k. We are ready to greet you on earth."

"How's the weather?"

"You will be coming down right in the center of an anti-cyclone. The weather is cloudless, a slight wind, some snow -- 15 cm -- temperature -21."

"That's great!" comes the surprised voice of Rukavishnikov.

"That's good: it will be invigorating," remarks A. Filipchenko optimistically.

"Happy landing. We'll see you back on Mother Earth," says V. Shatalov in conclusion.

Now comes one of the most crucial stages of the flight. In the sky over the South Atlantic the cosmonauts are preparing to turn on the braking engine. They now are wearing their spacesuits. For some time now the pressure has been raised up to the customary 760 mm mercury column. The green point designating Soyuz-16 on the map is approaching the calculated spot -- the orange. Now they have merged: the engine has been switched on at the designated time at an altitude of 213.8 km.

The cosmonauts report: "Everything is o.k. onboard. Heading for landing."

The big board shows the total flight time: 142 hr. These are the final moments of Soyuz-16's sojourn in space. But now comes the most exciting moment -- the separation of the sections of the craft. This is to take place over the continent of Africa, in the vicinity of Khartoum, above the assumed limits of the atmosphere, which is located at an altitude of 100 km. That is the point at which the shortwave signal of the on-board transmitter disappears.

Here it is! The stations have fixed the disappearance of the signal.

Controlled reentry is underway. The following words now show in lights on one of the screens of the room: "Reentry control system engines operative. Programmed turns of reentry capsule to attain designated angles are underway."

The spacecraft, obeying the will of the automation system, is turning in order to hit the calculated landing place, which is located near the city of Arkalyk, about 300 km north of Dzhezkazgan. Airplanes and helicopters are already cruising there.

During these moments, incandescent plasma rages around the descending spacecraft, which is enveloped in flames; it is created by the resistance of the atmosphere to its hurtling downward motion. An a distance of 2,100 km from the landing spot, the stations locate the fiery comet and begin to track it.

At this time it is impossible to contact the cosmonauts. Communication will be established later.

When atmospheric pressure reaches 165 mm mercury column, the lid of the parachute container blows off and the pilot parachute bursts out into the sky, followed by the drag parachute and then the huge main parachute.

It's over!

One of the helicopter pilots says:

"We can see the reentry vehicle on the parachute. There is an on-board beacon in the direction-finding mode."

And soon we can hear the animated radio conversations between the cosmonauts and the pilots. The cosmonauts are asking the pilots for data in order to compare them and refine the readings on their radio altimeters.

We hear the voice of Filipchenko: "Kolya, get ready, we're setting down."

Here it is! The soft landing engines have gone into action. The Soyuz-16 has landed on a flat, snow covered field. In one minute a helicopter lands next to it. Then another, and still another, and yet another. And in just seven minutes after landing, Anatoliy Filipchenko followed by Nikolay Rukavishnikov emerge from the spacecraft and again step out onto Mother Earth. The flight is finished.

Immediately the corridors of the control center are filled with noise -- everyone is congratulating each other, joking, talking excitedly. An improvised press conference is underway.

Aleksey Leonov says: "The program was a complete success. The crew performed very harmoniously; there was not a trace of fatigue up to the very end. The flight was a success at all stages."

The technical director of the Soyuz-Apollo project on the Soviet side comes into our room; he is USSR Academy of Sciences corresponding member K. Bushuyev, who has just been talking by phone with Houston. The first man in America to find out about the successful completion of the Soyuz-16 flight is the project's technical director on the American side G. Lanni [transliterated].

"Although it is now 4:00 in the morning there," says Bushuyev, "and I had to get him out of bed, he was very happy and asked me to convey his congratulations to the crew."

Bushuyev continues. "I want to emphasize the enormous importance of this flight. We made a large number of changes in the design of the ship; we jointly worked out a radically new docking assembly. Now all of the systems have undergone successful testing under conditions which are as close as possible to next year's flight. There are no problems in the equipment. The performance of the crew deserves high praise. Filipchenko and Rukavishnikov have manifested excellent skill as cosmonauts."

The flight manager A. Yeliseyev also remarks on the excellent performance of the cosmonauts and the entire control center.

He says: "All services of the control center have demonstrated excellent, harmonious performance. Now all that remains is to check the work of those services that will be directly interacting with the American control center. For the purpose a number of joint training sessions will be held, starting in December."

Candidate of Technical Sciences V. Syromyatnikov, director of one of the project's operating groups, told us that during the flight of Soyuz-16 another important event would take place: in Moscow tests were successfully completed of flying models of the docking assemblies of the Soyuz and the Apollo. Now they will travel to their own space ports only to meet once more in space in July of next year during the docking of Soyuz and Apollo. B. Konovalov.

Soft Landing

Reportage From the Landing Site of the Soyuz-16 Spaceship

There is a light breeze on the open steppe. The sky is clear and clean. The bluish snow sparkles blindingly under the rays of the bright sun. Broad fields, winding, ice-covered little streams, reddish brown boulders and bushes. It was here in the vicinity of Arkalyk, not far from a little lake, that the Soyuz-16 spaceship landed.

Arkalyk is the center of a very young oblast in the virgin lands, and the people of this region warmly and joyously greeted the spacecrew -- A. Filipchenko and N. Rukavishnikov.

At the designated time the reentry capsule entered the dense layers of the atmosphere. At an altitude of several kilometers it began a gentle descent by parachute. The loud pop which generally accompanies the opening of a parachute was heard by many steppe dwellers on sovkhoz imeni Titov, in the vicinity of which the cosmonauts landed. The could see the bright orange cupola of the parachute opening up like a fabulous flower in the blue sky. The spaceship settled down on a snow-covered field that was flat as a table.

One by one the helicopters hurry to the landing site; they accompany the reentry vehicle like an escort. Just before landing the soft landing engines went into action. And now another report for those who cannot watch with their own eyes the events on the field of the kolkhoz: the parachute is jettisoned, and the reentry vehicle stands in a vertical position. One of the members of the greeting group was to tell us later:

"We ran up to the capsule and the cosmonauts themselves opened the hatch from inside..."

There was a slight delay while the cosmonauts changed clothes: the weather on the steppes was freezing. A. Filipchenko and N. Rukavishnikov had to get into fur jackets and boots. As has been done since olden times on the steppe, after a long journey they drank a warm cup. And then, back into the sky in helicopters.

The rotary-wing machines bring the cosmonauts to the airport. The people assembled there greet A. Filipchenko and N. Rukavishnikov with applause. The space heroes are accorded the traditional hospitality. A rally develops spontaneously. A Filipchenkov speaks:

"Thank you for this honor and for your trust."

And then, "overtime" earth duties were added to their space duties. For it is tempting to get the autographs of these famous cosmonauts to keep as a souvenir of this meeting in Kazakhstan. Both of them went right to work. One of the flight directors made a plea:

"Let the boys rest. They've done a tough job out in space."

Signing another autograph, N. Rukavishnikov smiled: "Never mind, this is a normal thing."

The Kazakh national costume -- the chapan -- is placed over their shoulders as a souvenir. In response the cosmonauts say that they are happy to become honorary citizens of Kazakhstan.

The cosmonauts head for the airplane. They are to go to the spaceport where they will rest.

In the opinion of specialists, the health of the cosmonauts who have just returned from space is no cause for concern: this is due to the fact that during flight they did gymnastic exercises, including with an expander...

A. Filipchenko and N. Rukavishnikov walk up the ramp to the airplane. On parting, they say:

"So long! Until we meet again in this land of hospitality!"

The silver bird takes off easily from the conrete strip and speeds up into the sky. May all your launches be good ones, space heroes! IZVESTIYA Correspondent A. Yershov.

Celebration in Zvezdnyy

Despite the freezing cold, people have started to gather at the airport long before the cosmonauts arrive -- friends, relatives, other spacemen, designers of the Soyuz spacecraft, and specialists who have been working at the control center. All of them are wishing each other a happy celebration. This has become a tradition: the return of the cosmonauts to earth is a celebration for those who met them on the snow-covered Kazakh steppe and here at the airport near Moscow.

The airplane taxis up to the greeters and slowly turns. The ramp is brought up. A. Filipchenko shows himself in the doorway, followed by N. Rukavishnikov. They wave happily to everyone and then walk carefully down the ramp.

"Our country's mission is accomplished!" reports the Soyuz-16 commander. And immediately the cosmonauts are in the midst of the greeters. Then everyone gets into cars and they all travel to the town of Zvezdnyy. In accordance with tradition, Filipchenko and Rukavishnikov lay flowers at the marble pedestal of the monument to Gagarin. And then they are surrounded by the inhabitants of Zvezdnyy, who have poured out into the streets. Together with them the space heroes walk along the snow-covered road to the House of Culture of Zvezdnyy, where a celebration rally has been arranged.

All of the speakers at the rally remark on the excellent skill of the Soyuz-16 crew, whose performance can serve as an example worthy of emulation. Many of the speeches touch upon the idea of the importance of the Soyuz-Apollo program in the cause of strengthening peace on our planet. Our country is doing a great deal to relax international tension. The joint experiment of the two great space powers on the leading edge of science and technology will unquestionably aid the cause of peace.

Those taking part have enthusiastically accepted a letter of greeting to the CC CPSU, to the Presidium of the Supreme Soviet USSR, and the Council of Ministers USSR.

Filipchenko and Rukavishnikov express warm thanks to everyone for the high praise for their performance and express their gratitude to everyone who prepared the ship and the flight. "Despite the fact that we were very demanding with respect to the operation of the systems, we have no complaints," says Filipchenko. "Now we can undertake with confidence the docking with Apollo." B. Konovalov, special IZVESTIYA correspondent.

Soyuz Ready for Docking

Meeting Between Soyuz-16 Crew and Soviet and Foreign Journalists in the Town of Zvezdnyy

Interest in the voyage of the Soyuz-16, which was a dress rehearsal of the upcoming July 1975 joint flight of the Soyuz and Apollo, is now extremely high. The hall of the House of Culture of the town of Zvezdnyy, where on 12 December there was a meeting between the press and the Soyuz-16 crew, was filled literally to the limit with Soviet and foreign journalists.

V. Sofinskiy, manager of the press division of the Ministry of Foreign Affairs, who is in charge of the meeting, first gives the floor to the Soyuz-16 commander, twice Hero of the Soviet Union A. Filipchenko.

Filipchenko remarks: "The Soyuz-16 is similar to the ship which is scheduled in 1975 to take part in the Soviet-American experiment."

All of the tasks involved in testing the modified systems of the ship were carried out with special exactitude. Nevertheless, by and large there were no complaints with respect to the operation of these systems and equipment. The flight demonstrated the reliability of the Soyuz spaceship.

In his talk, Soyuz-16's flight engineer and twice Hero of the Soviet Union N. Rukavishnikov emphasized: "We can with confidence state that the Soyuz ship is ready for docking with the Apollo."

A. Filipchenko and N. Rukavishnikov expressed heartfelt gratitude to the Leninist CPSU and its Central Committee and to the Soviet government for praising their work highly and awarding them the Order of Lenin and a second Gold Star medal.

The next one to speak was the technical director of the Soyuz-Apollo project on the Soviet side, USSR Academy of Sciences corresponding member K. Bushuyev, who, like the other specialists sitting in the presidium, answered journalists' questions.

K. Bushuyev said: "The latest flight once more demonstrated that the Soyuz ship perfectly meets the requirements imposed by the tasks of docking and joint flight with the Apollo ship. This does not mean, of course, that preparations for the joint flight are complete. It is still necessary to conduct joint training sessions for the crews and the Soviet and American control centers and to resolve a number of other tasks. Only a little time remains, but everything is going according to plan."

"What do you consider to be the most important aspect of the upcoming docking of the Soviet and American spaceships?"

"In my opinion it is to demonstrate to all the world the possibilities of instituting firm cooperation between peoples of very different countries having differing social structures and differing ways of life."

Bushuyev says: "I should like to take this opportunity to announce to the assembled people the content of a telegram which I received from Dr. Kraft, director of the Johnson Space Center, and the technical director of the project Dr. Lanni. They congratulate us on the successful completion of the Soyuz-16 flight and express satisfaction in the fact that during the progress of the flight the American side received the necessary information; and they ask that their best wishes be conveyed to the cosmonauts."

The journalists are interested in knowing the reason for the fact that the post-flight medical examination program for the Soyuz-16 crew was coordinated with the American side. The answer to this question is given by the cosmonaut training manager Air Force Major General and twice Hero of the Soviet Union V. Shatalov.

"In recent years," he says, "we have been conducting a broad exchange of the findings of medical research with the American side. But such research is carried out in accordance with different methodologies. In order to compare the findings more conveniently, Soviet and American specialists have agreed on a unified procedure for conducting pre-flight, flight, and post-flight investigations. So that the process of training for the joint flight also includes 'medical docking.'"

"What new development has been introduced into training by the joint work of the crews in the two countries? What are the working relationships of the cosmonauts?"

"The new development is that the cosmonauts have had to study both their own ship and a foreign one. Our cosmonauts are now thoroughly acquainted with the Apollo and the Americans are acquainted with the Soyuz. The training of all crews is taking place in Zvezdnyy and in Houston, using our trainers and American trainers. The working relationships among the cosmonauts have developed very well, as have the personal and purely human relationships."

Speaking of the upcoming effort, V. Shatalov announced that in February 1975 our cosmonauts will go to Houston for the next joint training session. During their trip they are scheduled to visit the spaceport at Cape Canaveral and the Apollo ship while it is being prepared for launch. Correspondingly, when the American astronauts in May of 1975 come for their last joint training session in Moscow, they will be able to visit the Baykonur Space Port and see how the Soyuz is being prepared for launch.

A question about what new training equipment had developed in Zvezdnyy in connection with the preparations for the joint flight was answered by the chief of the Cosmonaut Training Center imeni Yu. A. Gagarin Air Force Major General and twice Hero of the Soviet Union G. Beregovoy.

He says: "A complex trainer has been designed which makes it possible to run all of the operations that are necessary for the joint flight and the crew exchanges. In addition there is a lock chamber -- a passage compartment -- where the cosmonauts can test run the passage process."

The flight director for the Soyuz-Apollo program, Doctor of Technical Sciences and twice Hero of the Soviet Union A. Yeliseyev, was asked how the joint training sessions of the Moscow Control Center and the Houston Control Center will be conducted.

His answer: "We have scheduled four training sessions of Soviet and American specialists involved in the flight control. All communications channels are being checked out now. In December will begin a trial exchange of the information which is being planned for the 1975 flight. Joint training sessions of the two control centers are planned for March, May, and June of 1975. They will be organized so that personnel involved in preparing the flight will be located in each control center. Crews will take their places in ground models of the Soyuz and Apollo ships, and there will be a simulated flight which corresponds to the actual one in its program. All of the

planned communications channels will be in operation between the centers, and the information exchange will proceed as during an actual flight. Both of the control centers will have consultation groups from the other side."

"What are the distinctive features of the upcoming flight in terms of control?"

"There are no special new problems. Among problems that have arisen for the first time I would mention the necessity of coordinating our actions with the other side. Another problem is posed by bilingual radio communications. The American astronauts will speak to ours in Russian, while our astronauts will speak to them in English. So that we are faced for the first time with the problem of determining what our own crew is saying. For this, the control center will have a rather large contingent of translators on hand."

In conclusion the Soyuz-16 crew answered journalists' questions.

"What will be the joint menu on the upcoming flight, and what will you be having to drink with the Americans?"

N. Rukavishnikov answers: "When the Americans are visiting us we will host them with Soviet space food. We have special stores planned for this. Correspondingly, onboard the Apollo the Soviet cosmonauts will be hosted with American food. Both of the crews have tested the food beforehand and selected what they like best. Naturally, they will not be drinking wine but rather water and juices."

"The editors of the central newspapers have received many greetings and congratulations from readers addressed to the Soyuz-16 crew. What would you like to say to them in response?"

A. Filipchenko says: "We are sincerely grateful for all the good wishes expressed by the journalists and newspaper readers and in turn we wish them good health and personal happiness. We have had our own personal dream -- not only to complete this flight but to carry it out well. This dream has been fulfilled. And we hope for all readers that their own secret dreams will come true." B. Konovalov, special IZVESTIYA correspondent.

CHAPTER 3. PRELUDE TO LAUNCHES

Top of the Pyramid. Notes of a Journalist Concerning the Soyuz-Apollo Project

On my way to America's Johnson Manned Spaceflight Center, located on the edge of Houston, all I knew about the city was that it is the sixth largest in the country and growing faster than any city in the United States. After I visited the center I had some time to get acquainted with the city, which is distinguished by quite curious parameters. I trust the reader will not object if I begin my remarks with some brief information about Houston. It will help to give some idea about life in the vicinity of the center.

During the 1950's, when power engineering and chemistry turned to focus on petroleum and gas, a petroleum processing and refining industry was founded here. A huge one. Houston accounts for one out of every four tons of petroleum processed in the United States: eight out of every nine tons of synthetic rubber are made here.

The city got another shot in the arm when some church organization made a gift to NASA of a section of land on the city's outskirts, where dozens of buildings of the Manned Spaceflight Center rose up. Since that time Houston has gained 600,000 inhabitants and has earned the right to be known as the fastest growing city in the country. Two million people live there now.

It may be that because the city crystallized so rapidly its center -- its downtown -- never had a chance to sprawl. Yet the residential section -- endless two-story houses surrounded by trees -- is so vast that airplanes of a local municipal line fly above Houston. For example, it takes 20 min on such an airbus to fly from the main airport to the Johnson Center.

From the air the city appears emersed in a sparce forest, while the sky-scrapers of the downtown area resemble a dozen pencils standing on a green cloth. This in its purest form embodies the American city-planning principle: two-story development construction and a highrise downtown. In other cities, for example San Francisco or New York, long evolution has left behind architectural rudiments. Competition among sections for the

right to be the center has imparted to city silhouettes an undulating outline. From afar they look like reclining camels.

In Houston's downtown it almost feels as if one has wound up in a monster funhouse: the walls of some skyscrapers -- from the pavement to the top -- are nothing but mirrors. The street, the sky, and the clouds are reflected in them. The building itself, like an apparition, is imperceptible at first. You stand in front of it and doubt the reliability of your own gaze.

Semi-transparent mirrors are the latest in protection of buildings from the sun, familiar to us in beach sunglasses which reflect part of the light. Houston itself is built up on the seashore -- possibly the hottest on the planet. It is right next to the Gulf of Mexico, from which the Gulf Stream carries enough heat to warm all northern Europe. It is said that the city could not have grown so rapidly if it had not been for the creation of an artificial environment for the people: air-conditioning in the home, automobiles, offices, shops, and stores...

Houston is a city which wants to set the pace. It has America's largest enclosed stadium. A unique department store which resembles a cross between a shopping center and an amusement park. The largest scientific medical center in the United States. This is the headquarters of the world-renowned heart surgeon DeBakey. The most expensive lawyer in the country -- Forman -- also lives in Houston. Alas, this city also holds a sorry record in serious crime.

Twenty years ago, at the first Geneva Atomic Conference, Soviet, American, and British scientists were for the first time able to tell the world of the results of research into the properties of the nuclei of uranium atoms and neutron particles.

I remember the atmosphere of the conference, at which the scientists of the three leading atomic powers were to give papers on the subject. It was like a recital of the best pupils getting ready to tell what they had learned. The curiosity and impatience prevailing in the hall contained something of a philosophical nature: this was a rare opportunity to compare the top processes of researchers in first one, then another, then another country. Everyone could sense how the respectable audience would erupt if the results diverged by even one iota! Of course, the subject matter was identical, but could the same be said of the human factor? Might not the upper hand be taken by those imperfections of intellect which cause schoolboys frequently to get different answers to a problem? Such cases are, after all, not rare. Professor A. Kitaygorodskiy has collected enough such instances in the history of science to compile an instructive booklet.

Those sitting in the hall knew that before their eyes was the culmination of an experiment which would show whether physicists of the three countries were able to converse with nature with equal ease. They also knew that the experiment was an extremely pure one. There was no way the scientists could influence each other: the data of the scientific information had just been released from the stamp of "Secret."

The physicists proved to be worthy of their science. The characteristics of the nuclei and particles coincided to the last detail. That day, a press conference was held by an American delegate, Professor Hughes. He showed a chart summarizing all of the findings. The scientist was proud of this impeccable line which, like a herald, proved the purity of the royal lineage.

The technical principles of reactor design also coincided: identical evaluations of atomic constants, like tickets bought for the same train, channeled trends in design within the three countries along a single itenerary.

Nothing like this took place when the designers of the Soyuz's and Apollo's met. The designers of the ships diverged on a number of points. Some of the technical differences completely ruled out the possibility of docking, at least in the form they were in when our two countries agreed.

As it turned out, each group of designers had its own ideas about the atmosphere that should be provided inside the ships, which radio frequencies were most convenient for communications, and which design was best for link-up and crew exchanges. The list of differences ranged from ideas concerning the shape of our planet and its field of gravity to specifications as to the fabric of the uniforms.

This was told to me by Konstantin Davydovich Bushuyev, corresponding member of the USSR Academy of Sciences and technical director of the Apollo-Soyuz Project on the Soviet side. He belongs to the old guard of space hands, those who launched the first satellite. I met him in Baykonur in the days when our first Vostok's were launched. Among journalists he quickly gained the reputation of a man with whom it is easy and interesting to talk. This was especially important at that time, everything was new.

Konstantin Davydovich is more than just a brilliant scholar in technology. He is one of the few people in the world who has integrated in himself the principles of spaceship design as developed in the two leading powers. These principles are far from identical, as the engineering schools that have developed are not identical.

Why are the people who designed the spaceships not possessed of the same unity of thinking that was displayed by the physicists who built the reactors?

The architects of the atomic era were obliged to guarantee the functioning ability of the neutrons in order to maintain a chain reaction. But this exists within an extremely narrow range. For a reactor, exact compliance with specifications is more important than the tuning of a radio receiver to the wave of a particular station.

The main hero of all events taking place in a spaceship is not the atomic nuclei nor the particles but rather the human being. And the designers are concerned above all with safeguarding his health and ability to function.

A living organism is incomparably more flexible than the lifeless subatomic particles. It can live and work in a broad range of environmental conditions. Because of this the designers were able to alleviate the burden of their difficulties somewhat. But the two groups of scientists produced ships that were so different that without adjustments they proved to be incompatible. At first glance this is an undesirable thing. But after some reflection one concludes that for space flight mankind has many technical possibilities rather than just one as it might seem.

One of the most important differences between the Soyuz and the Apollo was based, I would say, on genetic factors, if one may use a biological concept in talking about technology.

As everyone knows, in our spaceships the cosmonauts are provided ordinary air at ordinary pressure for breathing. The Americans, on the other hand, when designing their first manned ships, gave preference to an atmosphere composed of rarefied oxygen. This yielded a substantial gain in terms of weight. But they had to pay for it with the potential danger of a devasting fire aboard ship. From the smallest spark. During that period the few dozen kilograms that were saved overshadowed the spectre of tragedy. And, as the reader will recall, in the end there was such a tragedy.

The oxygen atmosphere used in the first American one-man Mercury ships was inherited, like a birthmark, by the Gemini and Apollo ships.

Nowadays the initial strict requirements on weight no longer apply, and the spaceship designers of the United States are more and more inclined to use our type of ship's atmosphere -- natural air at normal pressure. But it is too late to remake the Apollo, or, more accurately, impossible. If pressure is raised to one atm in the ship, the reserve strength of the hull will be dangerously low. That means that rarefied oxygen will have to continue to be used in the Apollo.

In planning for docking, then, is it possible to maintain the initial atmosphere in both ships?

It is in principle. All that is needed is to install a passage lock between the ships. Of course, in order to ensure that "desaturation" takes place -- that is, that the nitrogen dissolved in the blood of the cosmonaut is removed slowly -- it will be necessary to spend up to eight hours in the lock when making the passage from the Soviet ship to the American!

This is a great inconvenience when the two crews are doing joint work, when it is necessary to visit one another for certain scientific purposes. And it would be a genuine tragedy if one of the crews suddenly needed to give emergency aid to the other.

Another alternative was examined: the cosmonauts could go from one ship to another by putting on spacesuits -- as if they were going to walk in space. In that case there would be no obstacle, no necessity for a desaturation lock. But consider the inconvenience this would pose for joint work!

The air atmosphere system on the Soyuz proved to be sufficiently flexible to permit a compromise: to lower the air pressure in the ship and thereby to lower the solubility of nitrogen in the blood. This made it possible to shorten the desaturation period. However, the lower the pressure the less oxygen one gets in each breath and the more drastically the ability to function declines. This can be avoided by increasing the relative oxygen content in the ship's atmosphere.

By means of many experiments the medical technicians sought the most advantageous union of at least three parameters -- air pressure in the ship, oxygen content, and time of desaturation; these did not match the initial parameters of the Soyuz atmopshere. Here they are: air at a pressure of 530 mm mercury column (on earth this would correspond to an altitude of almost three kilometers), but with an oxygen content of 40 percent, or almost twice as much as in the air we are familiar with. Now it takes only 30 min for desaturation. This is 16 times less than if the ships were to be docked in their initial form!

Thus it became possible to match the "environment" of the two ships enough so that they were capable of forming a kind of ecological hybrid in orbit.

It is necessary to point out that other built-in peculiarities of the ships have not disappeared even after remodeling, and they have an effect on the experimental program. Consider this problem: which ship should take up a constant orbit and which one should maneuver? Who should correct the initial orbit until it coincides with the link-up orbit? Which one should take up a position in space that is most convenient for docking? Finally, which ship should approach the other.

Naturally, the criterion for making the selection was the reliability of performance of all operations of the docking. What does this reliability consist of? The expertise of the crews? But here there are no obvious advantages of one crew over the other. On the capabili of the ship to maneuver? If we consider here the matter of sensitivity to controls, again we find equality.

But if success depends on the ability of lengthy maneuvering -- for example, the ability to make several attempts if the first attempt is not successful -- then the ships can no longer be considered identical. The Apollo is a ship designed for the moon program, designed for lengthy and repetitive maneuvering. For the purpose it is provided with a large store of fuel. Our Soyuz was designed for earth orbits, where the need for maneuvering is

much smaller than for a moon landing. Moreover, everyone knows that the Soyuz ships have repeatedly shown their ability to change flight orbits.

In the upcoming experiment, mutual interests dictate the Apollo since it can carry more fuel. If the Americans had proposed their orbital ship Gemini for the joint experiment the roles would be reversed. The Soyuz would be the active ship, because its fuel tanks are more capacious than the Gemini's. Two travelers on the same road and thinking the same thoughts will always share a piece of bread!

"Of course," says Bushuyev, "the idea of docking ships belonging to different countries rests on completely objective necessity. International cooperation in space is the key to many problems. For example, weather forecasting, geological exploration, observations involved in environmental protection, and other international measures that can be handled only on a global scale. The possibility of docking and exchanging crews from ship to ship will make it easier for humans to resolve problems having to do not only with our planet but also,in the future, the entire solar system. This is understood equally well by us and our American colleagues."

"By experience I know," he continued, "that any technical issue being examined by the working groups can easily become a problem. And if either one of the sides gets a notion to drag its feet or hinder the project, there are plenty of opportunities to do so. And bad will can be easily concealed within labyrinths of straightforward circumstances.

"And yet over the course of three years that we have been working together there has not been even a hint of foot dragging. On the contrary, whenever anyone has gotten into a bind, the other side has tried to do everything to help."

Bushuyev has extremely high praise for the human and businesslike relationships that have developed between Soviet and American scientists, engineers, and cosmonauts involved jointly in the Soyuz-Apollo project. And for this reason he was very cautious lest any unilateral superficial enthusiasm cast the slightest shadow on the relationships developing in the project's working group. When talking about matters on the Soviet side he would add each time: "When you write about this do not use superlatives. It's routine engineering work."

And with respect to one dramatic situation, Bushuyev suddenly said: "I'll have to ask you not to write anything about that. I do not want us to be the first to evaluate items whose properties are required to match conditions on the Apollo. Let's wait to see what they say in Houston!"

Of course Bushuyev was right. But what crew journalist can keep a story that is so remarkable in many respects "locked up" in his notebook!

The matter had to do with the fabric for the clothing of the Soviet cosmonauts taking part in the experiment. As has been mentioned already, requirement specifications on the Soviet versus the American fabrics differed so much that it could have blocked the entire experiment.

The safety regulations on the Apollo prohibit bringing any combustible materials into the capsule, which is filled with pure oxygen. This embargo applied to the clothing of our cosmonauts, made of knit wool, which had served so well on previous flights. Also prohibited -- because of lacquers vulnerable to fire -- were our telecameras and motion picture cameras, which accourding to the program were to be brought by the Soviet cosmonauts into the Apollo ship.

The problem of fireproof materials is not a new one. It is an age-old problem. But it has always been a matter of preventing fire in an air environment. But here we had to prevent fire in pure oxygen! The level of fire resistance had to be much greater.

Obviously this could have become a long, drawn-out matter for our side. Would it be possible to synthesize such a fabric, such lacquers?

And here we must sing the praises of the research work of the scientists. Those efforts which, at first glance, would seem to be more necessary for substantiating somebody's theoretical views than for resolving urgent operational problems. In short, several years ago three chemists began to search for a method of building a molecule of a specific spatial structure. The way they figured it, a polymer chain bonded from such molecules would possess a number of important properties.

It will help to explain their concept by comparison with an ordinary polymer molecule with beads: the atoms are so to speak strung on a single strand. But a polymer made out of molecules of the new type must run on two parallel strands linked with transverse bonds -- something like a rope ladder.

To obtain such a double-strand structure it was necessary to have not just one monomer but two different ones which would alternate in the "ladder." One of them would be successful. The scientists undertook to find it.

And so the monomer was synthesized and then a mate was found for it. Finally, a substance was obtained which consisted of flexible "ladder" molecules.

Its properties surprised even those who had expected some kind of surprise.

A copper wire was coated with the new polymer to serve as insulation. It was placed on a steel slab and hit sharply with a hammer. The copper wire broke, but the plastic coating remained intact!

The secret of the strength lies inthe structure. If a rope breaks you cannot climb up it. But if one of two sides of a ladder breaks it is possible to climb the other side.

But how about chemical strength? Resistance to fire?

It would appear that the new material did not promise anything special: the array of elements used to synthesize it were quite ordinary -- carbon, hydrogen, nitrogen, and oxygen. Nitrogen can burn, and carbon and hydrogen are among the best known fuels. But the structure held: even in a jet of pure oxygen the new polymer did not burn!

I am, of course, discussing the first and very important stage. Nevertheless, it is hardly right to praise only the blast furnace operators for a well-made automobile.

The research work of the chemists then went over into the hands of specialists in synthetic fiber. A fiber called "lola" was produced. Then it turned out that it was necessary to add another fiber -- polyphene. Then the knitting specialists and health hygiene specialists got in on it -- to design a fabric that would be comfortable, healthful, and harmless in terms of various allergies.

Only after these collective efforts were accomplished were samples of the fabric flown to Houston, where they demonstrated properties that were even higher than those that were necessary to be allowed access to the Apollo.

Soon after that a telegram was sent to Zvezdnyy to announce that the fabric had been tested and was authorized for entry into the Apollo.

At that time the embargo was also lifted from my own notes.

Strange as it seems, a problem that was of much less concern than the clothing problem involved the differences in the models of the planet and its field of gravity assumed for the work of the space researchers in the two countries. And here we again touch upon the interrelationships between nature and knowledge.

Although Magellan sailed around the earth almost five centuries ago, we have such a poor understanding of the form of the planet that it is necessary to involve our imagination and to conjecture on what we do not know. When the space age began and ballistic computations became necessary, the Soviet and American scientists conjectured on the unknown in different ways, each in their own way. And so there are two geoids, as the geometric body reflecting the form of the planet is called. An American one and a Soviet one. In ordinary life this does not cause any difficulties. And it is no problem when the spaceships of the two countries are making independent flights. But what if they have to attain the same orbit? Will they succeed if, for example, according to the Soviet model of the earth Baykonur is located at an elevation of 300 meters above sea level while the American model places it at 350?

And that's not all. The nature of the field of gravity depends on the form of the geoid. To put it simply, will the force of gravity diminish more quickly or more slowly as altitude increases? For the launching of a spaceship, which is subject to the braking action of the field, this is appr .imately the same as for an automobile -- the question of whether it has to climb a steep or a gently sloping hill.

In short, if each of the two sides proceeded on the basis of calculations based on their own model of earth, the ships would surely end up at different altitudes and it is hard to say when they would find each other in space.

What is the solution? Postpone everything until we know the truth? Until we determine accurately the shape of the planet and how its gravity behaves?

That could drag on for many years.

Yet the situation was resolved relatively simply. It is not necessary to wait until we know the truth. All we need is to have approximate ideas about the form of the planet. Approximate and conditional as long as they are identical. Let us propose, for example, and let us assume for both Soviet and American calculations, that Baykonur is at a particular elevation, for example 325 meters. Then the rockets can carry the ships into the same orbit.

At the same time the Soviet side was altering the system of providing ship's atmosphere, the American side was busy with the passage lock where the cosmonauts will adapt to the "alien" atmosphere for exchange visits.

I saw this lock, already completed, at the Johnson Space Center in Houston, in one of those grey buildings of the center which draw attention to themselves by the almost complete lack of windows.

I went to the center from the King's Haven Motel in the morning before it got warm. I got to the space center rather quickly, but during that short time the sun had got so hot that as I got out of the car it immediately reminded me of Baykonur. Only there, 12 years ago, when the flight of V. Tereshkova and V. Bykovskiy was being launched, have I experienced such heat.

As a correspondent from IZVESTIYA, I was received by the project's deputy technical director on the American side, Dr. A. Aldridge and the director's technical aide, Dr. L. Nicolson. Both of them are young men, like most of our scientists in the space program. The director himself, Dr. G. Lanni, took a short leave in order to go camping somewhere with his sons and do some fishing.

We went into a small work room with tables and chairs. Immediately there were pots of black coffee. Spending the day at the center, I found that coffee regularly and automatically appears when the discussion will last longer than 20 minutes. The discussion proceeded at the same lively and energetic pace that I observed in local television broadcasting for which the principle"time is money" runs the show.

I should explain that I visited the center when all of the technical problems were solved by and large. The final stage was at hand: a run-through of the organization of the joint flight and docking. Everything was going according to schedule.

My hosts had high praise for the joint efforts of the researchers, engineers, and cosmonauts of both countries.

Nicolson said: "We believe that the docking system developed for this first experiment represents a rather advanced design which can be used for subsequent flights as well."

His colleague Aldridge added: "Thus, our efforts today have laid the groundwork for cooperation in future space exploration."

I asked them how they evaluated the human contacts among participants in such a complex and lengthy effort.

Judging by the smiles which my hosts exchanged they were waiting for this question.

"It is a pleasure to give our own evaluation of this aspect of the problem, although we are engineers rather than psychologists. In the efforts of the whole group working on the Apollo-Soyuz Project we must say that excellent mutual understanding has been achieved. Without a doubt we have become not only technical specialists whose ideas are interacting very well on a common basis but also simply friends. And everything is based on the fact that we combined our efforts to strive to resolve design problems as efficiently as possible. The fruits of this are to be seen not only in the technical advances and unanimity of technical thinking but also in simply drawing us closer together as human beings.

"Let us hope that specialists in other spheres of technology will also be able to cooperate as successfully as our two groups have. Joint efforts on scientific-production problems just proceed along a broad path of mutual understanding between the peoples and the two countries. We believe that the flight will show clearly that despite all difficulties we can work together not only for the benefit of our two countries but also for the benefit of all mankind."

These thoughts are reported here as a monologue, but they belong to Nicolson and to Aldridge.

After the conversation we went to look at the equipment involved inthe Apollo-Soyuz Project. Again there was the stifling heat and hot sidewalks along expanses of lawn. On our way we were met by Cosmonaut Evans of the back-up crew. We exchanged a few simple phrases in Russian. Obviously he was making a practice of demonstrating his progress in the language.

On our way we were overtaken by a man bringing a long ribbon of teletype:

"Dr. Nicolson! This is to you from Moscow, from Professor Bushuyev!"

It turned out to be a list of questions to which the Bushuyev group would want answers during the next telephone conversation between Houston and Moscow. A procedure had been instituted of making a telephone call once every two weeks. But this questionnaire would arrive in plenty of time before the call was made. In this way the telephone conversation would be well thought out, precise, and brief. A curious detail: telephone conversations are conducted in the language of the country which makes the call. As you can see, even 16,000 km fails to hinder the solution of one of the most difficult tasks of the century!

And since the discussion now is the topic of information, let me note that K. D. Bushuyev has high praise for the convenience of the American system of documentation, in which themes and sub-themes are designated as numerical entries. He also considered it proper that when recording entries, the American colleagues did not waste too much time on polishing the formulations The main thing was not style but rather the substance of the thought.

The excursion around the center began in one of the windowless operations buildings, where they prefer to make use of artificial lighting rather than to admit the sun's rays and with them great quantities of heat.

The first thing I saw in the building was one of the Apollo ships that had returned from the moon voyage; it had the same scorched places on the sides as our ships do. And there was the lock that I mentioned. The engineers called it the docking module. A long cylinder -- more than two meters. The ends were covered with green canvass. There were plates with inscriptions attached to the canvass. In English and Russian. When they removed the cover I looked inside. Rather spacious. And again the bilingual signs attached next to handles and levers.

In another hall they showed me a strange-looking machine something like a press. Only on the first level it had a structure that resembled a metal spider. On a wall next to the machine was a warning sign: "High Voltage Danger." Again, in English and Russian, like the series of signs on the control panel separated from the machine by a wire netting.

There at the control panel Soviet and American engineers were working. They had been testing the docking device for a total of four months.

I heard the most complimentary remarks about this machine from Konstantin Davydovich Bushuyev later on. Our discussion touched on how the docking device was being designed. Was the project assigned to one side? Or if both sides were working on it, who ended up drawing the blueprint? In short, I wanted to find out the technology of collaboration in such an intimate process as the creation of a new design.

"Let me remind you," the scientist began, "that both sides have already tested a docking device in operation. We and the Americans have both used designs that were similar in one basic respect: one of the ships was passive while the other was active; in other words, it could maneuver and operate with its own docking mechanism. The simplest analogy here is a key, which actively interacts with a passive lock. But this system has disadvantages: what if two passive or two active ships were out in space? They could not dock!"

But in order to permit a ship to dock with another, the new system would have to be more versatile. This was not just a matter of the Soviet-American experiment. It was necessary to work for the future, when manned orbital flights would become routine and the number of space powers would increase.

"You asked how we designed it? Remember the Arab parable about the conceited horse which kept asking Allah for better things -- a neck as flexible and long as a swan's, hair as furry and warm as a bear's, and so on. The result, as you recall, was the camel... We began," continued the scientist, "in similar fashion. Together we chose the best factors in the two docking assemblies -- ours and the American; we examined and compared systematically each mechanism with the other. If we ran into obstacles we broke down the task into even smaller parts. And we resolved them step by step.

"After the initial selection of the basic mechanisms, each side independently took its ideas into the design. At the next meeting we again compared, evaluated, and selected the best. In other words, there was a multi-stage selection process. Of course, it was necessary to wipe out the boundary between 'ours' and 'yours.' Vanity, as in the parable just mentioned, would be harmful in this as well. We were very exacting with respect to proposals, advice, and recommendations. We were also severe in our criticisms: everyone understood perfectly that only through exacting and critical examination of the engineering ideas would we be able to avoid creating something like a camel."

There was one circumstance, however, as I found out from Bushuyev, which so to speak limited the extent of the hybridization.

The Americans liked the shock absorbing mechanism in the Soyuz's docking system. (The mechanism was designed to soften the impact that might occur when the ships were brought together). They proposed introducing the principle of our device into their design. But they calculated the time and determined that it might delay the manufacture. Production difficulties! Specialists know that these days it is easier to design some unprecedented

structure on paper than to figure out how to do it later. It is no accident that "know-how" -- that is, technological procedures -- is a more important item of export than a design license.

For this reason, by mutual agreement, in order to save time, it was decided to limit new solutions just to mechanisms which would directly interact during docking. All of the other mechanisms -- including the shock absorbing mechanism -- were to be left in their initial form, to each his own. Just as, for example, it takes two hands to shake hands, but it is not so important to consider the biceps.

K. D. Bushuyev continued: "However exacting we were in our evaluations of the hybrid construction, we knew that our main judge would be -- experience. For four months we tested the new assemblies on a machine simulating the docking process. Mixed crews of engineers sat at the control panels. They ran through the approach of the two docking assemblies right up to coupling.

The machine for the testing had been built by the Americans during preparations for the flight to the moon. During that flight, components of the Apollo space system docked and undocked many times; these operations were of crucial importance. For this reason it was so vital to test the docking design on earth.

At first glance it would seem a simple task. One assembly attached firmly to the machine, the other held by four hydraulic cylinders (it was they that reminded me of spider legs) and imposed on the first.

That's fine if the ships come together like two cars rolling along a railroad track. But suppose they come together not end to end but at some angle? What will happen if the docking assemblies come at each other crosswise? How will they behave at some other angle, or yet another? This is what the tests were designed to answer. And that's why the mechanism moving the assembly was made to resemble segmented legs: it could vary these angles infinitely.

Yet another difficult circumstance. It is well known that all mechanical motions occur differently in weightlessness than they do on earth. Everyone has been amazed during space television broadcasts by the strange floating of pencils, movie cameras, and the cosmonauts themselves. The weightlessness might confront the docking ships with something unexpected. The Apollo and Soyuz are of differing weights: how will they behave?

Theoretically it is not all that complicated. On a spaceship in flight all of the same laws of Newton's mechanics are operative that are familiar to us from our school days. With just one difference: the acceleration of the force of gravity is eliminated from all formulas. But the question is how to test mechanisms designed for space here on earth, where it is practically impossible to be isolated from the field of gravity?

But consider: watching a cosmonaut's pencil turn end over end of the screen, you can take your own pencil in your hand and make it go through the same motions. The people testing the docking assemblies managed to fool Mother Nature in exactly the same way. The metal legs bringing one assembly close to another impart to it the same motion it would have in weightlessness.

In principle these legs are no different from hydraulic drives such as you can see on almost any tractor, where they also function as hands. The role of the muscles in these hands is played by oil: a pump injects it to push a piston which imparts motion, for example, to the grips which hold the docking assembly. In order to have the piston move as if in weightlessness it is necessary to accurately control the injection of oil into the cylinder. A computer controls the operation of the pump. It calculates how much oil must be pumped into the hydraulic drive at each moment so that the piston moves no faster and no slower than the Apollo and Soyuz docking assemblies in orbit.

The electronic brain, in controlling the hydraulic musculature, precisely imitates weightlessness. The people observing the tests told me that the movements of the docking assembly held by the machine's feet had a unique, unearthly majesty.

Perhaps it was because the technical problems were now behind them that Aldridge and Nicolson, when I listened to them, were much more concerned about the flight program, about drawing up the flight documentation. This aspect of the business appeared to them to be even more vital and difficult than the design aspect just completed.

In the program of an ordinary space flight all of the actions of a crew are scheduled down to the minute. Man's time in space is still the most expensive. The flight documents also contain recommendations for cases where an unscheduled situation arises. Approximately the same way we look through the owner's warranty manual on a household appliance to find information on what to do if the appliance ceases to function. Except that in our case we require the information because of our ignorance, whereas the cosmonaut needs it for the sake of speedy decision-making.

The document tells the cosmonaut how to achieve a particular purpose by roundabout means. When drawing up recommendations on earth, it is necessary to have plenty of imagination -- even a sense of fantasy -- in order to foresee unpredictable situations.

But here, it's not one ship but rather two ships that are going to have to interact -- and the compilation of documentation becomes many times more complex rather than merely doubled.

Any unscheduled situation makes it necessary now to find another means not only for the ship where such a situation arises but also for the other. Because in space, events can no longer be allowed to develop along invariant lines. Otherwise the situation on the ships will become uncoordinated and there will be no docking. This is the reason the flight documentation of the Apollo-Soyuz experiment contains seven kilograms of text. The same as three volumes of the "Great Soviet Encyclopedia!"

At the end of our talk I asked the two young scientists to evaluate the importance of the joint efforts on the project.

After some thought, Nicolson began: "If you are looking for an analogy, here is a suitable one. The work can be compared to the top of a pyramid whose base covers up a multitude of problems in the cooperation of our peoples."

This image is indeed a proper one, and not just because the Apollo-Soyuz Project involves a lengthy, almost three-year history: it has touched upon so many different aspects of human activity that it can serve as an example for cooperation in many other spheres of production and science that are not at all connected with space. Curiously enough, several days later at the other end of the United States I had occasion to be convinced of the correctness of this evaluation.

It was in Schenectady -- the location of the scientific center of one of America's largest industrial companies, General Electric. It was here that Thomas Edison himself, the founder of the company, built not only enterprises but also research laboratories. Now it is a whole scientific city, which nestles pleasantly in the lovely landscape: green fields, tidy groves of trees, a little, blue stream.

Long before the end of my visit, Dr. C. Huggens, director of the communications division of the scientific center, asked me whether I could find 10 min for us to change roles: he would ask me some questions.

In his office, Dr. Huggens turned for a minute to a blackboard similar to one in a school, and drew on it a simple diagram depicting two identical groups of designers, American and Soviet.

"Let's assume that your engineers and ours are to collaborate on the development of an electric tractor. Both groups have the necessary specialists. But here is the question: how is the chassis specialist from General Electric to exchange information and ideas with his counterpart in the Soviet Union? If all communications are channeled through the directors of the groups, for example by telephone, there will be losses of information -- for the directors cannot to the same extent understand the dozens of problems. But if each specialist is in touch only with his colleague across the ocean there will be losses between coordination between the groups. How should we structure cooperation between Soviet and American designers? Can you give me any advice on this?" said the director of the communications division in conclusion.

Right there I recalled the teletype questionnaire from Moscow which the staff member at the Houston center ran up to hand to Dr. Nicolson. That was indeed an operationally tested method of dialogue between specialists at the highest level! And I trust that the General Electric Company will derive some benefit from my account of what I found out at the top of the pyramid.

The Johnson Space Center has a Museum of Astronautics. Near a building, on the lawn, is a rocket which carried the first manned Mercury capsule. Inside the building are duplicates of the moon equipment used in the Apollo program. There also is the huge Skylab cylinder. You can walk through the various compartments of it and imagine how the astronauts lived and worked. Perhaps most difficult of all is to figure out how they managed to sleep in a vertical position held by straps. But the guide explained that one of them discovered that it was more comfortable to sleep upside down! It seems that in that case local air currents were less of a bother to the sleeper.

And here is a mockup of the Apollo-Soyuz docking assembly: a steel disc framed by three metal petals. Something like a daisy if you ignore some details of design... When two such discs come together, the "petals" on both of them turn to meet the approaching assembly and couple.

Another remarkable sight at the center is the room from which manned flights are controlled. The very room which is known to everyone who watched the television broadcasts of the Apollo flights. At this time there were no manned ships in space, and the room was empty and half dark. Only the map and display board on the wall were lit up... Now the time is not far off when the map in Houston, like the map in our own control center, will show two lighted sinusoids at the same time -- projections of the Apollo and Soyuz orbits...

My last visit -- to General Thomas Stafford. A small office with one window. Two or three certificates on the walls, a small display case with awards and emblems. A setting more picturesque than one might expect in a general's office. But also, perhaps, more modest than might be expected for an astronaut who has been in space three times.

Stafford, a large, broad shouldered man wearing a sport shirt, held out his hand and said loudly and firmly in Russian: "Zdravstvuyte!" I understood that to the commander of the Apollo crew I was not only a journalist but also an unexpected guest with whom he might test his Russian. Jane, our interpreter, one of the large groups of interpreters developed here in connection with the Soviet-American experiment, had told me beforehand that Stafford had recently been very diligently applying himself to our difficult language...

I began the interview in Russian: "How about the problem of communications?"

Stafford became animated; his face -- the face of a man who has seen and experienced a great deal -- was transformed by a smile.

"We have been working with the Russians for a long time and have established good personal relationships. Now we have hit upon a useful idea on how to exchange information during flight... The Americans will speak in Russian and the Russians will speak in English."

The cosmonaut spoke slowly, with pauses, but correctly. It was obvious how difficult it was for him, but when he finished a sentence his face would light up with pleasure.

I must admit that at the time I did not appreciate the value of the idea. Would it not be better to formulate one's thoughts in the language one knew best? It would be more accurate and concise. But on the other hand, it is difficult to pour information from a wide-mouth vessel into a narrow one without spilling down the sides. And what guarantee is there that the most vital part would not be spilled. Conversely, there is complete certainty that the stream from the narrow-necked vessel will not bypass the broad ears of the recipient of the information.

The cosmonaut continued: "Our experiments show that in this way we can understand one another completely. It creates a shared communications channel. There is progress in the speed of information exchange."

It seems to me that I'm not the only one that has noticed that in recent months both Soviet and American cosmonauts, whenever they give interviews, infallibly talk of studying the language of their comrades on the future flight. At first glance this has the air of a school or student problem -- learning the fundamentals of a language plus ship's terminology. But the last time I heard Cosmonaut Aleksey Leonov speak he began very seriously, not at all in a student's manner, spoke of his success in studying English. Behind these discussions you can sense something more vital than a simple desire to tell about one's success in a new subject of study.

Indeed. What are the basic components upon which the experiment's success depends? The condition of the equipment. The organization of the flight control. Finally, on the correct interaction of the crews. The docking maneuver -- it will not be automatic but manual -- as well as all subsequent actions of the people in orbit will depend primarily on their ability to exchange the necessary information than to utilize it properly.

Yes, the time is coming when the knowledge of a language will become the only link on which will hinge the results of the labor of dozens, hundreds, and thousands of Russians and Americans who have prepared the ships and rockets for the unprecedented flight. During those moments the cosmonauts will have to remember that on their success depends the hopes of the peoples of the planet for success in cooperation in all spheres of science and production, for the sake of the vital interests of all mankind!

But success is impossible without the exchange of information between crews. While the ships are seeking one another in orbit. While they are approaching one another, and during docking. And each of the cosmonauts participating in the flight in the final analysis will be obliged to rely only on himself. He will have to know the language of the other participant in the experiment. But is the communication channel he possesses reliable? What is its throughput capacity? Will it stand up under the load? The participants in the experiment understand very well their responsibility for the success of the project. This is the reason why they are more and more talking and thinking about language problems. If anything bad should happen in orbit because of language problems it would amount to more than simply a "D" in foreign languages!

I continued my conversation with Stafford: "What about the psychology problem? What they refer to as compatibility?"

"I have been in space three times. Twice onboard the Gemini, and no problem of this nature ever arose. I don't think it will. We have been working with the Russians for almost three years, and there have been no difficulties. Everything is going fine, and it will do so out in space -- after all, we are friends! Mutual ties between the Soviet and American people constitute a sphere which is broader in scope, of course, than our space efforts now. But we spacemen are the leaders in the process!"

"What do you think of the comparison with the top of the pyramid?"

"I like it. It fits."

The last time I saw A. Leonov and T. Stafford was side by side on Red Square, at the spot near the Mausoleum, where cosmonauts usually stand during celebrations. But this time there were other members of the crews taking part in the joint experiment, and all of their Soviet colleagues in the celestial profession. This was on May Day.

Stafford, who together with Leonov arrived a little later than the others, shaking hands, kept saying: "Happy May Day!" His comrade astronauts were using lots of film, stretching tall so that their cameras would take in as much as possible over people's heads. Everything was as it should be for people invited to a celebration by their friends.

Ahead of them -- more and more training sessions. Now, the main thing was to work out the teamwork of the crews and both flight control centers. The entire flight will be simulated several times jointly on earth. Now, the life of both crews and their ships is involved in a single joint program. Separated by 16,000 km, they have so to speak fused into a single organism, with a single system of information and feedback. One more step has been made toward the linkup in orbit, which will crown the unity of wills and thoughts of the two great nations which have decided to stand shoulder to shoulder confronting the universe. Georgiy Ostroumov, special IZVESTIYA correspondent, Houston-Moscow.

The Five Speak in "Russton"

> This essay is about just one aspect of the Apollo-Soyuz joint space flight -- its crew, which consists of two Soviet cosmonauts and three Americans. They are, of course, very different, these five men of the first international space crew. They are individuals, and what is individual -- character, temperament, and habits -- never repeats itself. What unites them is not just a random similarity of traits.

1. Creativity

In my opinion it is more difficult to discern the most outstanding trait in the character and manner of Aleksey Arkhipovich Leonov than for his partners in the flight. That he is desperately brave, being the first man to walk in space, is undeniable. That he is a talented artist -- a painter -- is unquestionable. There is something common to all his various qualities; the common basis is the creative attitude of Leonov to every step of life, to every act, to every line painted.

Let us refer to the letters and notes which he wrote during the training sessions and the last flight, to the journals of his comrades -- the most persuasive arguments.

"On my first day in school I said to myself: 'You must always be excellent. Aviation does not forgive mediocrity...' From this has derived all of my practice: give all of yourself to study and to work, not a single minute for foolishness, no wasting of time with tricks... In my opinion it takes much more effort to invent sly tricks and be afraid you will get caught than to simply and honorably fulfill your duty."

"I will be glad if they [sponsored schoolchildren],turning to the world of art, will love it, will grasp it; for a person who understands and appreciates art is himself creative..." "We flew over Moscow. How beautiful it is at night! Especially when viewed from above. Lights like beads on a string, the bright glow of different colored neon signs, the astonishing play of semi-tones. And everything alive, breathing, winking, smiling, and then vanishing into the dark."

This figurative language is characteristic of Leonov. A simple journal entry three years before he became famous (this is said for skeptics who assume that it is a "pose"); his creativity begins with small details.

"...I was admiring the sunset. A bright orange-red stripe lay right on the horizon. If such colors were to be applied to a canvass right next to dark grey people would say: it's not realistic, it never happens. But nature combines the colors very boldly."

And in these lines, tinged with a slight humor, Leonov stands forth as an attentive observer of the living scene.

From a letter to a friend: "You were, of course, acquainted with Yuriy Gagarin. You will remember that he was visiting me on the day Svetlana was born. Modest and shy. If you do not recall it, then it's only because of that and because you yourself were the center of attention with your Navy stories."

After Gagarin's death, Leonov wrote: "His simplicity lay in the fact that he did not evade anything, he did not restrict himself to the necessity of being like everyone or being different from everyone, and when things were difficult for him he did not try to make it seem easy, and when he felt good and happy he did not pretend that he was not in the mood for merrymaking; and when he sensed that he had blundered he knew how to acknowledge it openly and frankly."

...It was the 20th minute of the historic flight of Gagarin. The radio conversations were filled with inquiries about his first impressions, about the operations of the systems. His answers were calm, quick, and precise. He was there in space, but at the same time on earth with the others. From the tape of the radio conversations of 12 April 1961: "Nine hours 27 minutes. Kedr (Gagarin): Greetings to Blondin!" Blondin was the name the cosmonauts gave to Leonov and the first name pronounced from space was that of Leonov.

And then Leonov himself made history. The first man to walk in space: "floating out of the hatch into the infinite space of the universe, I caught sight of the indigo blue of the Black Sea, the snow-capped peaks of the Caucasus, the haze-covered basin of Tsemesskaya Bukhta, and farther to the right, the scattered white crystals of the sanitoria of Sochi... There arose a feeling of indescribable freedom... Nothing hampered movement through the bottomless ocean of space." The program alloted him 600 seconds of creativity. And Leonov tried to retain every second in his memory, knowing the enormous value of it. But not one word -- note well: not one word! -- about the risk, the danger, the possibility of catastrophy. And here was this open space unknown to people! "...A side glance at the spaceship, flying against a background of sparkling constellations. It looked much more magnificent and beautiful than on earth. Just such a concentration of the human intellect crystallized into geometric form."

...At the end of June, after the completion of all the training sessions, the crews of our Soyuz were given a well-earned week off -- the last one before the flight. Some crew members went back home, some went to the seaside. Leonov spent his leave at the easel and at his desk: he had to finish a book entitled "EPAS [Apollo-Soyuz Experimental Flight] in Pictures" for the Malysh Publishing House, and also a picture that he had planned some time ago. Creative work, to him, was like breathing.

2. Knowledge

There is a wish to see a profound symbolism in the fact that in the first international space flight, embodying the idea of worldwide cooperation and creativity, technical ideas of construction in space are also being tested at the same time. This experiment bears the designation "universal furnace," and on it -- as on the whole research program of the flight -- by virtue of status and, the main thing, by virtue of the disposition of his thinking, Valeriy Nikolayevich Kubasov -- candidate of technical sciences, cosmonaut-pilot, and Soyuz flight engineer -- has a direct opinion.

Participation in a space flight, the top of the social scientific-technical pyramid -- requires at least that the knowledge of the cosmonauts themselves be on par with that level. But with respect to flight engineers these requirements are even higher. They are genuine scientists, who have merely transferred from their earthbound office to the space capsule. Kubasov is of the same type of space researchers as Doctor of Science A. Yeleseyev and Doctor of Science K. Feoktistov. He joined the team as an already-recognized specialist and a candidate of science. (One scientist among the group of specialists who administered pre-flight tests on the EPAS systems admitted: "Everyone received a well-deserved 'A,' but as for Kubasov... I could with a clear conscience offer him my examiner's chair.").

3. Experience

Among the group of those taking part in EPAS, General Thomas Stafford has been given the name "grandpa." One must assume that it's not because of grey hairs. I assume that the thing about the 44-year-old "grandpa" came from our boys when they saw this unhurried man on the job, in the trainers, on the test stands -- a man who knows better than many the "price in space" of each second of decisive action and of the hours of intense waiting. And when I asked Vance Brand for his opinion of the most important quality of General Stafford, he did not even take time to think before answering: experience!

The arithmetic of the experience of T. Stafford totals 23 years in the sky and in space. But much more complex and instructive is the algebra comprising these years of deeds and acts. After the Naval Academy Stafford flew many types of airplanes for 10 years, completed test pilot's school, and "broke in" dozens of planes at the Edwards Air Base in California. He has 6,200 hours in the air, including more than 5,100 flying jets. But he wanted to go higher and faster! So Stafford decided on space.

In 1962 the American team, the first seven astronauts, was expanded by the addition of a second group consisting of nine men. They were selected out of 200 candidates based on the following criteria: a special aviation education, considerable experience piloting jet and high-altitude airplanes, a second diploma for specialization in physics, biology, or engineering sciences. The astronaut had to be no older than 35 years and no taller than six feet (183 cm). Stafford -- then a captain -- met all these requirements, if you leave out height, exactly six feet.

As of today there are only a few people in the world who can boast of having done the space "hat trick" -- three trips into space. One of these few is Stafford. Two times he climbed aboard the spacesnip Gemini -- in 1965 with W. Schirra and in 1966 with E. Cernan. Both times the launch was postponed because of malfunctions detected at the last minute.

These flights did more than just strengthen his stamina and calmness. The Gemini-6 flight accomplished the first rendevous in space, with the Gemini-7 that was launched later; the Gemini-9 flight accomplished the first docking of three types with a special adapter,equipped with an additional target. The Gemini-9 flight was also remarkable for the accuracy of the return to earth -- only 640 meters from the designated target. These two experiments did a great deal to boost Stafford's chances for a place on Apollo-11 -- the first flight scheduled to land on the moon.

But it was decided that Stafford, with his experience and endurance, was more essential on the preliminary voyage of Apollo-10. It was a flight of great technical importance. It was necessary to check all of the aspects of the earth-to-moon flight, to carry out all control procedures except for landing. The psychological burden! Stafford and Cernan moved into the lunar module, separated from the main module of the ship, went into lunar orbit,and for eight hours circled the moon closer than anyone ever had before. They had an excellent view of the moon's mountains and craters; they photographed and mapped the spot for man's first landing on the moon -- the crew of the Apollo-11. After the flight of Stafford, Cernan, and Young aboard Apollo-10 only 12.8 km separated mankind from the moon...

Three such flights and twice in the role of backup crew member (on Gemini-3 and Apollo-7) amounted for Stafford more than just 290 hr and 15 min of space time. What is especially important to modern space research, in particular our joint EPAS, is what these hours produced. Expert skills, endurance, composure, and calculation -- everything which is involved in the concept "experience."

By 15 July, when the EPAS program begins, Stafford's Apollo companions will be getting on in years. Brand is also 44 years old. Slayton is going on 52.

The President of the United States, when meeting the crew, said jokingly: "We can only feel sorry for those who were too young for this flight." What he had in mind, of course, was all that "experience."

Kubasov grew up in the Vladimir region, where everything is of good quality -- history, background, manners. It may be that his homeland -- understood in the broad sense and at the same time specifically -- is the source of his thoughtfulness and even the penetrating way that he undertakes anything whether it be school, institute, or work. In school -- a silver medal; in the Moscow Aviation Institute -- all work "outstanding." Outstanding references for his work in a special design bureau. Member of the cosmonaut team since 1966.

Valeriy is an engineer by training and job experience; the breadth of his research interests is outlined by the logic of his profession itself. He is equally strong in ballistics computations and in the theory of spaceship control. Nevertheless, in my opinion, he had a "technocratic" predilection. I would formulate this as an inclination toward the "technology of creation."

Kubasov's institute work dealt with one of the tasks of technology of aircraft. The graduate brilliantly (according to the testimony of Professor A. Abibov, head of the department) demonstrated the usability of one of the lastest technological methods of those years -- chemical machining in the process of manufacturing aircraft bodies.

First time in space aboard the Soyuz-6 in October of 1969 (you will recall the group flight of Soyuz-6, Soyuz-7, and Soyuz-8) -- and immediately a most unique technological problem: the first welding in space.

And now a unique experiment -- the "universal furnace" -- is included in the program of the joint Soyuz-Apollo flight. In essence, it involves seven different experiments proposed by American and Soviet scientists to determine the effect of weightlessness on the technology of the production of various materials, metal and semiconductor materials. Metallurgists and physicists are hoping to find radically new ways to develop materials with special properties that are essential for production in space and on earth.

Despite all the cautions to the effect that a scientist in orbit, of course, should not be there to set up just one specific experiment, that he should not be a narrow specialist in the field, that his tools are knowledge, scientific polish, the ability to analyze and, of course, correctly "intervene" if necessary during the experiment -- despite all this it is Kubasov who, logically, gets into programs with a technological bias. He knows how to do this; he understands how vital it is -- to know the techniques of building in space.

Some time ago the director of Soviet cosmonaut training V. A. Shatalov, in introducing Kubasov to the American specialists, jokingly remarked: "If anything breaks, he will weld it." In 1969 the American colleagues gave a high evaluation to the Soyuz-6 flight. The chief of the American astronauts' training group T. Stafford was one of the first to congratulate the flight: "Research into the possibilities of welding in space is of great importance... Your people have done an outstanding job." Well, this time it appears fate has found it convenient to send Kubasov and Stafford on the same flight.

4. Bravery

In the statement "He deserved this flight" there is a hint of condescenion; although not intentional. It is truer and more honorable to write: "He earned the right to be in space!"

The American astronauts' team came into being in 1959 with the first "magnificent seven," as they say in the United States. Number seven,(by alphabetical order) in the roster, was the 35-year-old pilot Captain Donald Slayton. He was already grey at the temples; outwardly he seemed reserved, and his glance was strong and direct. His personal forms showed that he had been a pilot since autumn of 1943, the time he graduated from a training course at Vernon and Waco in Texas.

Slayton flew his first military mission over Italy, at the time the allied forces were landing. By the end of the war the B-25 medium bomber commander had flown 62 missions.

After that, the University of Minnesota; a diploma in aeronautical engineering, and more flights...

Slayton will never forget the date 15 March 1962. That day, two months before he was to become the second American in space (onboard the Mercury-Friendship-7), during a medical examination the doctors detected "irregular arrhythmia in the function of his heart."

The defect was, in general, so insignificant that the medical men vascilated for some time before they pronounced sentence: remove his from the flight program. Now, after years have passed, it is clear that the decision of the doctors was characterized more by caution than by sound argument. But Slayton was categorically prohibited from flying even an airplane without a copilot. In NASA he became the director of space operations; in practice this meant the director of selecting and training space crews. It was Slayton who selected both Stafford and Brand for the space team.

All those years he kept trying to overturn the verdict of the doctors through intensive training -- gymnasium exercises, flying airplanes, and two miles of jogging every day in the park. He was the only one who believed that he could come back. Slayton recalls: "It is difficult to explain this, but the arrhythmia always disappeared after a good run!" It is interesting to note that to this day no one has determined the cause of arrhythmia such as Slayton has, although the outstanding American cardiologist Paul White has been studying the problem. According to information appearing in the American press, Slayton was cured of his arrhythmia by taking quinidine, which Doctor White advised him to take. After two years of regular treatment, in 1969 all of the symptoms of the arrhythmia disappeared, Could it be that he would be given another chance in space? Yet the doctors of NASA require new proof -- straight from the heart! The series of cardiology tests included, among others, the following: two microscopic probes were inserted in Slayton's artery and moved directly to the heart.

The reward for Slayton's dedication was a NASA decision that he was fit for space flights. It was March of 1972. Remember March of 1962, when his Mercury was preparing for liftoff? Over the 10 years, dozens of astronauts had been launched into space, many of them trained by Slayton himself. He knew NASA's plans better than others; he knew that he had

one hope: the Soyuz-Apollo flight. Long before the official selection of the crew began, Slayton began to study Russian. Life had taught him to appreciate even the apparently insignificant opportunities for achieving goals. Six out of the first seven men had flown in space prior to 1963. Up to now, only number seven -- Slayton -- has never been there.

This is what he says: "I would rather be a 50-year-old recruit than a 50-year-old hasbeen."

5. Striving

As it happens, we wrote about Vance Brand in NEDELYA very recently (issue No 18). We wrote all about the man, his family, his way of life, his hobbies, his opinions, and "his job" -- space, where Vance has never been, but toward which he has constantly striven.

Brand joined the astronauts' team in 1966. Prior to that he was a Navy pilot, and later a civilian jet and helicopter test pilot for Lockheed. He has flown several thousand hours. He was educated at the University of Colorado and the University of California. Houston was the 14th city to which Brand moved his family. But Joan, Vance's wife, does not grumble; she is a construction supervisor, and there are construction projects everywhere. The only thing is that the children -- four of them -- rarely see their father: formerly he was always going on flights, now he is training for a major flight. Vance has an impressive list of space missions which he has completed. Twice he was in moonship support crews, and three times he served on backup crews. But all of this only took place on earth.

Our meeting with Vance in Moscow took place the night before the American astronauts flew to Baykonur. I remember his saying intensely and meaningfully: "Tomorrow for the first time I will see Baykonur, where Gagarin was launched. By that time I already knew that man would surely fly into space, but I was stunned by what happened!"

When the American astronauts returned from Baykonur I asked them for their impressions. "Your Baykonur is quite similar to the location of our Edwards Air Base in California. It's great that the way into space in your country and in our country starts on similar ground."

It is essential to understand that concerning each of these five as well as their comrades on the backup crews we can with full justification say that they are creative, experienced, knowledgeable, brave, and striving. These are the kind of people that will guarantee the success of any large undertaking. Incidentally, all of them have spoken about one particular difficulty involved with the crew -- the language problem. Now, this difficulty is behind us as well -- our cosmonauts know English and the

Americans know Russian. But, of course, during the flight there will be just one language on board. The Americans call this linguistic Russian-American hybrid"Russton" (one syllable from the word'Russian' and one syllable from the word 'Houston'). The five will be speaking one language, for convenience. A. Malinov, NEDELYA scientific reviewer.

Zvezdnyy: The Final Kilometers...

Only one month remains until the exciting moment when the fiery flames will burst from the mouths of the rocket jets and the Soyuz will leap into the sky, there to dock with a ship of another space power for the first time in history in the black ocean of space. The final joint training session has already been held; the crews are ready for flight. Nevertheless, the training sessions continue. Both in Zvezdnyy and in Houston.

The experimental Soyuz and Apollo flight is remarkable for other reasons besides the first orbital docking of the ships of different countries. In addition there will be a kind of"docking" of ground control services, scientific programs, and procedures of medical examination. Thirty days before launch -- truly a "magical" number for the medical men. In accordance with agreement, the medical men will examine the cosmonauts and astronauts, 120, 45, 30, 15, and 5 days before launch. One month before launch the most complete medical examination will take place.

The joint flight of the Soyuz and the Apollo is a brief one. The medical men are interested in more than just the data concerning the cosmonauts' condition; no less important -- perhaps even moreso -- is the opportunity to compare them now and to exchange them in the future. For this purpose, procedures have been "standardized" for observing the cardio-vascular system, the vestibular apparatus. These days, A. Leonov, V. Kubasov, T. Stafford, D. Slayton, and V. Brand, like the other crews, have been following a standard procedure of pedaling bicycle ergometers, conducting tests in a vacuum where rarefaction is created in the lower half of the body to induce a flow of blood there, undergoing various analyses, and taking anthropometric measurements.

One of the directors of the medical preparation of the Soviet cosmonauts, A. Yeremin, told me that the examinations made 120 and 45 days before flight showed that there were no deviations in the health condition of the cosmonauts. Physically they were superbly prepared.

Especially dilligent in his approach to health is the commander of the first crew, Aleksey Leonov. He runs and swims every day. If he does not manage to do so during the day then he does it after he is off duty. In Zvezdnyy they joke that his tirelessness has fatigued the trainers. Valeriy Kubasov also feels fine. They try to make use of every free hour to enhance their health. They are studying English intensively, because it will serve them well soon.

When I looked in on the Soyuz training ship, I heard a sentence out of future actual radio conversations in orbit:

"Apollo, I see you, we are heading for docking!" says Aleksey Leonov in English.

But 10 minutes later in his office, not yet having removed his training suit, he was making a date by telephone, with his little daughter Vika and Gagarin's little daughter Galya to go swimming.

"Before you get here I will already have run a couple of kilometers." B. Konovalov, IZVESTIYA special correspondent.

Baykonur in Zvezdnyy

We were heading toward the town of Zvezdnyy near Moscow, but we ended up... at the Baykonur Space Port. At exactly 9 o'clock in the morning A. Leonov and V. Kubasov, already dressed in their spacesuits, entered the room where the Soyuz trainer was. But then it was explained that it was not 9 o'clock in the morning on 18 June but rather 14 hr 20 min on 15 July -- the concluding overall training session was going according to the schedule of the actual joint Soyua and Apollo space flight. One hour remained before launch.

The only thing that reminded one that this was a training launch was the beief pre-test procedure. The ship's commander pulled out a sealed envelope containing the "tactical exercises." Its contents were unknown to either the crew or the personnel taking part in the training session: the cosmonauts and the specialists directing the flight from earth will have to demonstrate their complete readiness for the upcoming Soviet-American experiment.

USSR Cosmonaut-Pilot V. F. Bykovskiy, chief of the crew training division for the Soyuz-Apollo program, said: "This is known as an overall training session for other reasons besides the fact that earth-based specialists are taking part in addition to the crews. There is also the fact that this session will not run through just individual components of the flight but rather the entire complex of actions of the cosmonauts and ground-based services within the independent Soyuz flight section. The joint segment is being run through together with our American colleagues, and we consider this task to be completed. Moreover, everything in this training session will be like the actual flight: not only in terms of time but also the crew's sensations. The cosmonauts will hear the sound of the engines and watch through the porthole as the cone descends; they will see the stars light up in space and the hurtling of our earth below. Naturally, the only thing we cannot simulate is weightlessness and the corresponding G-forces."

Then a voice over the loudspeaker: "Control on board. Lower your helmet visors." On the television screens you can see A. Leonov and V. Kubasov obeying the command. Next: "Five minutes to go." At last -- the long-awaited "blastoff!" The countdown begins: "Forty seconds, flight proceeding normally!" The crew is functioning precisely and confidently. But the methods engineers sitting at the control panel have already unsealed the envelopes with the "tactical exercises"; the main task lies ahead. Its results will become known only late in the evening -- the training session is scheduled to last 13 hours. But it is appropriate to point out that the day before the same kind of training session was successfully passed by the second and third crews. Their evaluation -- "outstanding." Yesterday morning we found out that the first crew as well was on top of things in the full sense of the word.

Next, A. Leonov and V. Kubasov will undergo a thorough medical check. And after a short rest they will have to take part in joint concluding training sessions with the Soviet and American flight control centers.

USSR cosmonaut-pilot Leuitenant General V. A. Shatalov told journalists: "Recently the role of the Soviet cosmonauts training center has increased considerably. It is sufficient to note that now we are conducting two programs parallel to one another: for the Salyut-4 flight and for preparations for the Soyuz and Apollo flight. This gives evidence of our growing capabilities.

"We have also acquired a command training station which will make it possible to train ground-based specialists in their collaboration with the crew. In addition to training missions, this station carries out considerable methodological work. Thus, 12 video films concerning the Soyuz were made here; they have been used extensively to train American astronauts for the joint flight."

But now, an intense silence prevails here. Everything is just like and actual flight. Except that the ground-based measurement stations located in various sections of the country are this time located at neighboring desks in the same room. Nevertheless, the operators are completely ready in case one of the tactical exercices calls for having one of the NIP [Ground-Based Measurement Station] take over the communications responsibilities that are usually performed by the control center.

Thus, the cosmonaut training session is accomplished strictly in accordance with the coordinated Soviet and American schedule. And just at that moment the message comes in to Zvezdnyy: preparation of the Soyuz for the upcoming flight is also proceeding according to schedule. PRAVDA special correspondent A. Pokrovskiy, Zvezdnyy.

Final, Pre-Launch...

Concluding Joint Training Session of Soyuz and Apollo Flight Control Centers

"Soyuz, this is Moscow. Good Morning. How do you feel?"

"Moscow, this is Soyuz. I hear you loud and clear," answers Aleksey Leonov, commander of our first crew. "I feel fine."

This is the last joint training session of the Moscow and Houston flight control centers prior to the launch of the Soyuz and Apollo. Our cosmonauts A. Leonov and V.Kubasov are in a Soyuz training ship, while T. Stafford, V. Brand, and D. Slayton are in an Apollo trainer. All of the personnel of the centers are at their posts.

On the large screen of the main room of the Moscow Control Center is the enormous map of the world, familiar to us from the flight of A. Filipchenko and N. Rukavishnikov onboard the Soyuz-16; on it is the flight trajectory resembling a sinusoid. Except that now instead of one green moving dot -- Soyuz-16 -- there is a moving image of the linked-up Soyuz and Apollo. During this last training session, using real time -- the same time schedule that will be held to during the flight above earth -- the entire joint segment of the flight has been run through on 29 and 30 June and 1 July: from ships' docking to undocking and the carrying out of two scientific experiments: one of which is the artificial solar eclipse.

The right-hand corner of the screen shows an image of the central room of the Houston Control Center with its control panels that are similar to ours, and the American specialists sitting at them; in front of them, taking up one entire wall, is a map of the world with the trajectory of the flight of the linked-up spaceships. Periodically Moscow sends a message to Houston. Since 27 June the control centers have been in direct communication. We can see red telephones at many control panels in our own central room. You can pick up the receiver and talk to Houston. This communication will not be interrupted until the flight is completed.

The screen shows the image of the American Apollo training ship. In the center we can see Commander Thomas Stafford.

In Russian he says: "Astronauts and cosmonauts can speak with each other, with Moscow and with Houston."

Onboard our own trainer, Valeriy Kubasov makes a trial report in English concerning the design of the Soyuz.

Special "training personnel" are sitting in both centers -- the Soviet and the American; plotting among themselves by direct telephone, they are concocting "tricks" against the crews and the earth-based personnel. They

can command particular systems onboard the ships to "malfunction" so as to create (in the terminology the centers use) unscheduled situations; this, in essence, is the purpose of the training session.

For example, during this training session, 40 minutes before the scheduled docking, the Soyuz crew informed our control center via Houston that there was no automation signal to indicate the readiness of the docking assembly. What is it -- a malfunction of the docking assembly itself or of the data sensors? It must be checked out quickly, but at that time the Soyuz is out of range of radio visibility with our ground-based and floating tracking stations. The Moscow center asks Houston to help them establish communications with our ship. But Houston answers that it cannot, because it has its own problem -- it is preparing to correct the Apollo orbit. The control center is about to postpone the docking, but the crew saves the day. A. Leonov and V. Kubasov themselves, without help from earth, have worked out a system of test checks and determined that it is the data sensors that are malfunctioning rather than the docking system itself.

Right while we were in the control center there was a telephone conversation between the directors of the Soyuz-Apollo Project on the Soviet and American sides -- K. Bushuyev and G. Lanni. Glenn Lanni tells him that this time the personnel are raging. In less than two days there have been more than a dozen malfunctions of different structures onboard the ships. K. Bushuyev comforts him. "Tough in training, easy in battle."

Meanwhile at the spaceports, in parallel with the training sessions of the control centers, preparations for launch are in full swing. They began to fill the fuel tanks of the Apollo on Cape Canaveral on 16 June. Now the ship and the Saturn rocket have been fueled. Now the pre-launch checking of the systems is underway. At the Baykonur Space Port they also completed one of the important operations of the pre-launch preparations on 1 July -- the Soyuz ship's tanks were fueled.

In Moscow and Houston the final training session and critique were completed on the evening of 1 July. B. Konovalov, IZVESTIYA special correspondent. Soviet Flight Control Center.

Separated by a distance of more than 9,000 miles (16,000 km), Soviet and American cosmonauts have successfully completed the final training session before their joint scientific experiment in space. This was announced at the Kennedy Space Center on Cape Canaveral, Florida, by a spokesman for NASA -- the National Aeronautics and Space Administration.

In addition to the cosmonauts, the last training session prior to the Soyuz and Apollo flight was successfully completed as well by the ground-based services of the Soviet and American flight control centers.

On 2 July the American cosmonauts T. Stafford, D. Slayton, and V. Brand are flying from Houston to the Kennedy Space Center on Cape Canaveral to take part in a separate rehearsal of the Apollo launch, which is scheduled for 15 July. Flying with them to Cape Canaveral will be their backup crew.

Everything is ready for the Soyuz and Apollo launches, said the NASA spokesman in conclusion. V. Baydashin, TASS correspondent. New York.

Destination: Baykonur

On 3 July, Zvezdnyy said goodbye to the cosmonauts. By now, everyone there is used to goodbyes and reunions. But this time there was special warmth and excitement. After all, this is the first time that emissaries from Zvezdnyy have gone on an international flight, and you can hear the traditional "good luck!" more frequently than usual. "Everything will be very o.k." says Aleksey Leonov happily at the airport.

Hands are waved for the last time. Aleksey Leonov and Valeriy Kubasov disappear into the airplane, and with a roar the TU-134 takes off at 1500 Moscow time. Destination: Baykonur. From there the cosmonauts have a straight road into space, to rendezvous with the American astronauts. B. Konovalov.

IZVESTIYA Interview: Space -- The Arena of Cooperation

World Scientists Comment on Upcoming Soyuz-Apollo Flight

> Recently in the Bulgarian city of Varna the 18th Session of KOSPAR completed its work; KOSPAR -- the International Committee on Space Research -- is the most prestigious and representative forum of scientists engaged in space research. And although there were no papers dealing with the docking of the Soyuz and Apollo (KOSPAR only discusses the results of work that has been done), the upcoming flight was, of course, a major topic of conversation among the scientists. The IZVESTIYA correspondent asked several imminent specialists in the field of space research to share their ideas concerning the significance which this flight will have for world science and international cooperation in space.

Professor K. deJagger, President of KOSPAR

During the joint Soyuz-Apollo flight a large number of extremely interesting experiments will be carried out -- astronomy, biology, and technology. But, valuable as they are, even more important to science is the fact that the scientists of two countries were able to combine their efforts in order to carry them out. It seems to me that the joint Soyuz-Apollo flight is the first step along the path of the development of a worldwide space technology, the creation of which will to a certain extent be participated in by all countries. Then mankind will be able to implement very bold and heroic projects.

KOSPAR is an organization which came into being especially in order to implement international cooperation among scientists in space. It is extremely important that this cooperation become strengthened with each passing year, that more and more joint projects be implemented. In recent years there has been increased cooperation among scientists, and the small countries also have the opportunity to place their instruments on spaceships. Soviet-American and French-Soviet cooperation, also the Interkosmos Program, are having considerable effect on the development of space research.

By their very nature, space exploration is global in nature, touching all mankind. For example, research into such problems as relationships between the earth and the sun, the laws of weather formation, and the changing climate on our planet are equally important for people all over the world. In addition, space technology is helping to promote scientific-technical progress; it is making it possible to set up a worldwide network of communications, a worldwide system of navigation for ocean-going ships and aircraft, also to arrange a system of education via earth satellite. For the developing countries, such as India, which does not have enough teachers, this is of enormous importance. And the joint Soyuz-Apollo flight, which undoubtedly will stimulate efforts in the field of space research in all countries, is of significance not only for the two countries but also the entire world.

Professor Kirill Serafimov, Scientific Secretary of the Bulgarian Academy of Sciences, Director of the Central Laboratory of Space Research

We Bulgarian scientists understand especially well the significance of international cooperation in space exploration for small countries such as ours. In 1965 the Soviet Union generously offered the scientists of the socialist countries to utilize -- without charge -- the Soviet space-rocketry complex to launch international satellites. Thanks to this, both we and our colleagues from the socialist countries are able to place our instruments onboard earth satellites and take part in the leading edge of modern science. It is obvious that by herself Bulgaria would not be able to build a rocket, a spaceport, or tracking stations. And we very much appreciate the opportunity afforded us by the Interkosmos Program. On the other hand, space research is so complex, it requires such a broad range of different kinds of spheres of science and technology, that the use of the intellectual potential of the smaller countries is of great significance to the larger ones as well. For this reason, international cooperation in this field is beneficial to all.

The joint flight of the Soyuz and the Apollo is of great significance for strengthening international cooperation in space exploration. Unfortunately, for a long time space was an arena of rivalry between the two leading space powers. The development and strengthening of the process of peaceful cooperation between countries having different political structures has made it possible to overcome this "barrier." And the joint flight is an excellent indicator of the softening of the political climate on our planet.

At the same time, the beginning extensive cooperation in space, in turn, is helping to strengthen the process of the relaxation of international tension; it is creating a mood favorable to the peaceful resolution of problems confronting mankind. It may be that space, like no other area, provides widespread understanding of the fact that we live on a small planet. The objective conditions of life serve more to bring peoples and nations closer together than to disunite them. Through combined efforts we could resolve such worldwide tasks as the regulation of climate, the control and safeguarding of the environment on our beautiful planet, and much, much else. Our planet needs peace, and we can sense this with special acuity as we venture into space.

Professor Jean Deniss, Head of the French Delegation
to the 18th Session of KOSPAR

There is much controversy in France today concerning what path to take in further space research. But in all planning, in all discussion, Soviet-French cooperation is obligatorily taken as axiomatic. It has proved to be very effective and fruitful from a scientific point of view, and very pleasant with respect to the human aspects. Meetings with Soviet scientists are creative in character, and joint projects are implemented rapidly

The last joint Soviet-French experiment -- Arax -- at magnetically-lined points on the planet, on the Island of Kerguelen in the Indian Ocean and in Arkhangel'skaya Oblast -- showed that through combined efforts we are capable of implementing extremely complex projects. During the experiment, hundreds of specialists worked in concert in the southern and the northern hemispheres; they used rockets, ocean-going vessels, radar sations, and very complex on-board and ground-based equipment. Only the excellent mutual understanding and the superb organization made it possible to achieve the complete success of the precise experiment in physics in the gigantic "laboratory without walls" the space surrounding earth.

The joint Soyuz-Apollo flight is an even more complicated experiment. At first it seemed tc me to indicate foolhearty boldness on the part of the part of the Soviet Union and the United States to undertake such an enormous job. But as I became better acquainted with the equipment for the flight, with the crews who will have to carry out the docking maneuver, I became more and more convinced that everything would succeed.

It is extremely important that before the ships get together in space the Soviet and American specialists -- leaders in current space exploration -- get together. Their joint efforts are important for all mankind. Systems and docking devices are now being tested for all future manned flights and orbital stations; they will make it possible for the space fleet of different countries to come to the aid of one another in case of necessity.

Undoubtedly, international cooperation in space will continue to develop. On the one hand, space is vital to us all; on the other hand, the experiments are costly, and it is advantageous to make use of a "division of labor" among various countries. Each country can undertake a part of the work in an international project and share equally in the fruits of the joint efforts. In my opinion, projects such as the flight to Mars should be a worldwide undertaking. In this case, competition is unthinkable. And in general, it seems to me, a new era is coming into being in space exploration. We are converting to cooperation and combined efforts for the sake of the vital interests of all mankind.

Leonard Jaffey, President of the
International Astronautics Federation,
Deputy Director of NASA for Applied Research

For me personally the observations of the earth's surface being made by cosmonauts and astronauts onboard the Soyuz and Apollo are of great interest. Investigation of natural resources from space is one of the most promising directions in the use of space technology for practical purposes, of great importance for all countries -- both developed and developing. In addition, I am very interested in the use of the communications satellite on this flight. During the docking with Soyuz, Apollo will maintain communications with its control center in Houston via a satellite which is placed in what is known as a geostationary orbit -- that is, it appears to be suspended above a single point on the planet. This is the first time such an experiment has been carried out with the participation of astronauts, and it is of great importance for future flights in earth orbit. Thanks to geostationary satellites it will be possible to maintain continuous communications with the astronauts during the entire flight; it will not be necessary to restrict communications to zones of radio visibility from ground-based stations and ocean-going ships.

But of course the very fact of preparing the first joint international flight overshadows the importance of any one of the experiments. The upcoming flight demonstrates that the two leading space powers can work together. We have created two very complex machines which can dock in space. Both of the countries have worked toward the common goal. It is a promising way to explore outerspace. The combining of efforts will make it possible for us to advance forward at a more rapid rate.

The development of standardized docking assemblies will make it possible for ships of various countries to come to the aid of one another and to complete routine dockings. I can see many other spheres in which cooperation between the Soviet Union and the United States will yield mutual benefits. We could combine our efforts to investigate natural resources, to develop a worldwide system of communications, to study the oceans, and to deal with problems of meteorology. All of these are fields which touch upon the interests of all people. Cooperation in this could be of enormous practical benefit.

Herbert Friedman, Director of the Scientific
Division of Space Research of the United States Naval Research Laboratory,
Member of the National Academy of Sciences

One of the most promising potential directions in space research is extra-atmospheric astronomy. Considerable fundamental discoveries have already been made along these lines, and we may expect changes in our views concerning the make-up of the universe. During the joint Soyuz-Apollo spaceflight, in accordance with a prearranged program, observations of the universe will be made from onboard the American ship, in soft x-rays by means of a special telescope which has a photon counter with an area of 1,200 sq cm. A similar x-ray telescope which is smaller in area -- Filin -- is onboard the orbital station Salyut-4. In addition, the Soviet cosmonauts will make observations by means of the RT-4 mirror x-ray telescope. And scientists will be very interested in comparing the data of observations from onboard the two manned spaceships.

The scientific task of the experiment onboard the Apollo is investigation of remnants of flares from supernovas and the study of some variable stars. In particular, considerable interest attaches to observation of the x-ray source Cygnus X-1, where we assume the presence of a so-called "black hole" -- a star which has collapsed to an incredibly dense structure. Another interesting object of investigation is located in the Centaurus-A galaxy. It has variable radiation and, evidently, dimensions that are rather small in the scale of the universe, on the order of one light day. Light travels from one end to the other in one day. Within this compact source, brightness changes rapidly; it emits an enormous amount of energy. It is unclear what kind of formation this is -- perhaps a black hole, perhaps something else.

These observations are extremely interesting from the standpoint of verifying hypotheses advanced by Soviet scientists. Academician V. Ambartsumyan was the first to express the idea that the nuclei of galaxies are centers of explosions. And the Soviet astrophysicist I. Shklovskiy has expressed the hypothesis that matter with a mass of more than 100 million suns will rapidly collapse into a small object. It may be that this is exactly what we will see.

In my opinion, the joint Soyuz-Apollo flight can serve as the first step toward carrying out extensive experiments in space by various countries in a coordinated program. This will sharply improve the effectiveness of scientific research. We may expect more interesting and reliable results if we plan our research efforts so that they complement one another.

In thinking about the future, through joint efforts it will be possible to resolve tasks which are too complicated and costly for one country alone. International cooperation, for example, would make it possible to build a huge telescope in space to make extra-atmospheric observations, or to send an expedition to Mars to bring back samples of Martian rocks to earth. For this reason, the first link-up of the ships of two leading space powers is a symbol of joint cooperation of the nations of earth in space exploration.

Ernst Stulinger, Deputy Director of the
George Marshall NASA Space Flight Center for Scientific Research

The joint Soyuz-Apollo flight is causing considerable interest in America. You can hear people talking about it very frequently on the streets in friendly conversation. We scientists and technicians are especially pleased that the whole world will be shown graphically that space equipment developed in different countries can be used to resolve common tasks. Enormous importance attaches to the development of compatible docking assemblies; this is opening up the way to the development of a rescue system in space. With the development of space technology and the increasing number of manned space ships in orbit at the same time, such a system will be vitally necessary.

To a large extent, the evaluation of this flight depends on who you talk to. Everyone has his own opinion. In my opinion, however important the purely scientific research conducted onboard the orbital ships and stations is, it is essential primarily to think about making space exploration profitable and an economically advantageous undertaking.

From this standpoint I consider extremely important the technological experiments that will be carried out during the Soyuz-Apollo flight. In particular, I am interested in the Electrophoresis Experiment; during it, a stream of liquid will intersect an electrical field perpendicular to it. It is essential to determine how the components will separate under the effect of the electrical current in the absence of the force of gravity, in weightlessness. The goal of the experiment is to isolate samples for medical and biological research; the experiment may help to organize the production of especially effective vaccines and serums in space for use in earth medicine.

In the so-called "universal furnace" installed onboard the Apollo there will be a joint Soviet-American experiment to produce different alloys of metals and semiconductor compounds under weightless conditions.

These and other experiments are directed at the future; they may in time take on purely commercial importance, when whole factories will be built in orbit for purposes of performing economically beneficial technological operations.

The Soyuz-Apollo flight opens an era of joint activity in space exploration. We are very pleased that in the course of preparing for this flight we have found a common language with our Soviet colleagues and have learned to work together. In a relatively short time we have, through joint effort, resolved a number of difficult scientific-technical tasks. I retain a pleasant impression of your cosmonauts. I am much impressed by the character of the Soyuz Commander Aleksey Leonov. He is lively and sociable; he makes contact with people easily. I hope that our cooperation will not be confined to just the Soyuz-Apollo flight but will be continued in the future.

Soyuz-Apollo: Launch of the Journalists

Report From the Moscow Press Center

There were about 700 Soviet and foreign journalists in the conference room of the high-rise Inturist Hotel. In accordance with tradition an international press center has begun operation there; this time, to organize the work of the correspondents from newspapers, radio, and television arriving in Moscow from all continents in order to cover the joint flight of the Soyuz-Apollo spaceships.

The first press conference was opened on 10 July by V. N. Sofinskiy, director of the Press Section of the Ministry of Foreign Affairs. At his suggestion the journalists asked the Soviet flight control center to congratulate the Salyut-4 Commander Petr Klimuk on his birthday, which he was observing that day in orbit.

Almost at the same time, the press center in Houston began to go to work; incidentally, the room in the Moscow Inturist is linked directly to it by telephone and television. The Ostankino Television Center also served as a branch of the Moscow Press Center; there, 27 studios were set up for foreign television companies which sent their own representatives to cover the joint flight. In the press center itself, the journalists had at their disposal 20 Telex stations and 10 international telephone channels; the press center was constantly in touch with the Soviet and American flight control centers; the journalists could watch the direct broadcast of the launches in Baykonur and on Cape Canaveral. In other words, none of the correspondents would lack for information.

Their first surprise awaited the journalists in the hall of the press center: a docking assembly of the Soyuz and Apollo ships. As one might expect for this highlight of the program, people crowded noisily around it. But the main event, no doubt, would be the onboard press conference with flight participants. It would take place on 18 July, when Soviet and American cosmonauts onboard their linked-up ships would spend 22 minutes answering the questions of correspondents working in the Moscow and Houston press centers. Since the time alotted to the press conference would not be very long, an international commission of journalists was set up today to select the questions for the press conference in space.

Incicentally, the first question asked at this first press conference came from the correspondent of the Japanese press agency Kyodo Tsushin, who asked where above the planet the docking of the Soyuz and Apollo would take place. The director of the press conference answered: on that segment of the orbit of the joint flight between Barcelona and the Crimea.

Thus, the international space press center was launched. M. Rostarchuk.

Busy Days in Baykonur

Special IZVESTIYA Correspondent Boris Konovalov Transmits From the Space Port of Baykonur

Leninsk -- Space City

The Soyuz, sheltered by the white helmet of the cone, has been carefully rolled up on the mounting car by the test personnel to the third stage of the rocket. On 11 July began one of the last stages of the assembly -- the hitching of the head module to the carrier. The end of many months of work by the spaceport's testers is at hand.

A long series of electrical tests of all systems is now complete, both individual and overall; pneumatic-vacuum tests in which the entire ship is checked to ensure that it is airtight in an enormous thermal vacuum chamber which can freely accommodate an entire ZIL truck. Also completed are tests conducted jointly with American specialists to ensure the compatibility of all of the Soviet and American equipment that will operate during the Soyuz-Apollo flight: radio equipment, mechanical connections, and movie and television equipment.

Now the ship has left its stocks and is ready to sail into space. All that remains is to connect it to the stages of the rocket, the fiery power of which will place Soyuz in orbit.

Arkadiy Il'ich Ostashev, director of ship testing at the spaceport, tells journalists: "The plan is being implemented strictly according to schedule. There have been difficulties, but the schedule is being strictly complied with. In the preparation for this flight we made use of an improved procedure of assembly and testing of the modified Soyuz, and we are confident that the ship is reliable. These are busy days of the concluding operations of assembly and the last check of the system. One feature of this stage is that each operation is being done definitively for the last time. There is no turning back now, next comes the launch."

For the spaceport these are truly busy -- hot -- days in both the figurative and literal sense of the word: daytime temperatures are over 40° in the shade. At the end of April, when American astronauts were here, everything was in bloom: the steppes were a riot of tulips, and green grass gladdened the eye; now all you can see is the boundless desert, scorched by the blazing sun. The American specialists at Cape Canaveral, of course, are working in much more pleasant climatic conditions; the ocean is right there -- in the summer it cools things off, and in the winter it brings warmth. Aleksey Leonov told how they went swimming there in March with the water at about 20°. People looked at them as if they were crazy: "It's cold!" At our spaceport winter brings temperatures of -40°, to say nothing of the wind which penetrates to the b[illegible].

But there is nothing you can do about it: the laws of ballistics and the enormous desert expanses stretching for hundreds of kilometers all around have made this place convenient for rocket launches. Twenty years ago, when Gagarin was still a student in the Aviation School, the launch complex began to come into being here; it has gone down in history together with the first satellite and the first human in space. And the word Baykonur has become famous throughout the world.

At the same time as the spaceport of Baykonur, 50 km away, on the banks of the ancient Asiatic river Syrdar'ya, the town of Leninsk also grew rapidly -- the city of the conquerors of space. The American astronauts were astounded by this up-to-date city of 50,000 people, built in the desert. Movie theaters, clubs, and swimming pool which the people of Moscow might well envy, and a fine Palace of Pioneers -- the young city has a great deal to be proud of. But probably the main thing that is impressive here is the greenery of the trees and the abundance of flowers. When you find yourself in this blossoming oasis after the endless yellow sand, you think you are standing before one of the miracles of the world.

In Sayany I heard geologists sing plaintively: "One-hundred thousand trees to every man." On the desert area where the city of Leninsk was laid out to accommodate 50,000 persons, there was not a single tree.

Now, on the banks of the river, next to a municipal beach, there is a huge shaded park with tennis courts, volleyball courts, the usual kinds of park attractions, and a Ferris Wheel. Getting on it, you rise slowly into the air, and you can see before you the Syrdar'ya, which has become shallow from the sultry heat, and which divides the horizon into two parts: the yellow-brown desert beyond the river, spotted with white patches of salt, and the city submerged in greenery: two worlds: one fashioned by nature, the other fashioned by man. How difficult this was is indicated by the following fact: almost every tree has its own patron -- a person who takes care of it.

Leninsk is a city of space workers, who know how to perform miracles in the sky and on earth. Not for nothing has the bard of Zvezdograd Ivan Miroshnikov named the local inhabitants "The Tillers of Space":

> Even though our land is not bounteous with grain,
> And the steppe is white with salt,
> In the sky the track of the rocket resembles
> A furrow in a field.

Soon a new "furrow" will cut into the sky over Baykonur; it will for the first time connect with a "furrow" stretching from another continent. Only a few days remain until the launch of the Soyuz and Apollo, until the gathering in of the crop from the international space harvest in the common field of cooperation.

The Rocket Heads for the Launch Pad

By tradition the rocket and the ship are brought out to the launch pads early in the morning. On 12 June at 7 o'clock in the morning local time, 5 o'clock Moscow time, a diesel went slowly into motion, and the openings of the jets of the rocket, sealed with bright red caps, appeared on the doorway of the installation-testing building of the spaceport. During the first moments when it was being brought out, the rocket appears to be unbelievable long, as if its 49-meter body had the ability to stretch. First comes the "tail" -- the first stage and the four cone-shaped lateral modules, widening toward the tail. They screen on all sides the 28-meter cylinder of the second stage. An openwork crosspiece, and then appears the orange-colored protective cone which screens the engine of the first stage, followed by the third stage together with the ship which is connected to it. And when the entire rocket is visible, painted with white enamel, you can see that it is astoundingly beautiful.

The rocket moves off slowly. In a solemn manner. It is greeted silently at the gates by the creators of the space rocket complex, the testers. It has all of the seeming of a parade. The locomotive moves slowly, hardly faster than a man walking. It is as if the rocket were floating over the steppe. And when it comes up to the open service girders in the launch position, it somehow reminds one of the mooring of an enormous ship.

A gentle shove, and the boom of the erector begins to rise, slowly bringing the huge machine into vertical position. This is extremely exacting work: between the rocket and the service girder in some places there are clearances of only 100 to 200 mm. The tail section drops down to a depth of about seven meters. There it is awaited by a mobile service cabin which will go down under the concrete prior to the launch.

The rocket stands vertical; the horizontal period of its existence has come to an end. Now it will only head upward, into the sky.

The four support girders clamp shut, enclosing the body of the rocket in a ring almost three meters in diameter. They butt up against the rocket like trusses and hold it vertically suspended. Outwardly they now resemble a green pyramid from which a slim white column extends upward. When the rocket begins to rise, it will gently nudge these four sectioned girders to the side. They will leave the point of balance, and counterweights attached to their lower end will immediately remove them further, clearing the path of the rocket heading into the sky. The designers have given this system the fanciful name of "tulip."

The American specialists visiting the spaceport at Baykonur were delighted by this simple and clever device. They make use of complex equipment and electronics to remove the service girders in time at the start of the launch. Ours has been built on the principle of the simpler the better.

The rocket which has been brought up to the launch pad today will rise into the sky over Baykonur from 15 July at 15 hr 20 min Moscow time in a northeasterly direction. After pinpointing the orbital parameters of the Soyuz, in seven and one-half hours the Apollo ship will be launched. During that interval of time the American ship, having been launched, will reach the orbital plane of the Soyuz, and it will be possible to carry out maneuvers to rendezvous the two ships. The "launch interval" for the Apollo -- the time during which it can be kept at the spaceport without harm to subsequent operations -- is just 10 minutes. If this "interval" is not used, it will be one day before it occurs again, and as before it will be for only 10 minutes.

The Soyuz can allow the Apollo five attempts if for some reason the Apollo cannot be launched. After that it will land. In that case, another Soyuz -- a backup ship -- will be launched into orbit and will also allow five "intervals" for the Apollo launch. The second Soviet ship may also come in handy in case the first Soyuz for some reason has to make an emegency landing before docking with Apollo.

On Sunday, 13 July, a second Soviet rocket with a Soyuz ready for flight is brought out onto the back-up launch pad. All preliminary work is going strictly according to schedule.

The technical director of the Soyuz-Apollo Project on the Soviet side K. Bushuyev has told journalists that on Cape Canaveral everything is also proceeding according to plan. The American project director G. Lanni is satisfied with the progress of the operation.

K. Bushuyev announced: "I am also pleased with the progress of preparations, and I am confident that the joint flight will be successful."

In on issue of the newspaper MOSKOVSKIYE GUBERNSKIYE VEDOMOSTI in 1848 there appeared an amusing news item: "For seditious talk about flying to the moon, Citizen Nikifor Nikitin to be banished to the Kirgiz town of Baykonur."

How was the newspaper to know that one century later Baykonur would become the cradle of rockets heading not only to the moon but also to distant Venus and Mars, while ships and orbital stations launched from there would make earth's orbital space habitable and earthlings could live and work for months in space?!

The pace of the 20th Century is rapid, and now, when the efforts of the two leading space powers are being united before our very eyes, undoubtedly the pace will accelerate even more. The launch being prepared in Baykonur today will speed up the rate of space exploration.

Before the Distant Journey

Six men sit in the conference room of the new Hotel Kosmonavt, separated from us by a glass partition. The flight directors have just finished confirming the three Soyuz crews. There were no unexpected developments. The health of the cosmonauts and the process of preparations held no surprises. On 15 July the crew of the Soyuz-19 will be launched -- Aleksey Arkhipovich Leonov and Valeriy Nikolayevich Kubasov.

Their backup crew consists of Anatoliy Vasil'yevich Filipchenko and Nikolay Nikolayevich Rukavishnikov. It was they who blazed the trail into space for the first crew, having tested under space conditions a modified Soyuz ship which was the double of the one which will fly tomorrow. During the launch these experienced veterans will be in the command bunker at the launch control center. They will maintain communications with the crew during pre-launch preparations and during the segment of going into orbit. For A. Leonov and V. Kubasov their voices will be the voice of Mother Earth. In the event that Soyuz-19 cannot wait for Apollo in orbit or if Soyuz-19 itself has to make an emergency landing for some reason A. Filipchenko and N. Rukavishnikov will be launched into space on the backup Soyuz to make a "second attempt" of joint flight.

The second backup crew -- Yuriy Viktorovich Romanenko and Aleksandr Sergeyevich Ivanchenkov -- are young cosmonauts who have never yet been in space; but they underwent training for the flight on the same level as their older comrades, and in the opinion of A. Leonov, they know their equipment superbly. In Zvezdnyy I attended a test in English being given to all three crews. The commission unanimously remarked that Yu. Romanenko knows English better than anyone.

The support crew -- Vladimir Aleksandrovich Dzhanibekov and Boris Dmitriyevich Andreyev -- is now in Moscow. They will maintain communications with Soyuz-19 from the Moscow Flight Control Center.

We are just entering the era of international flights, and we can be assured that the young cosmonauts will still have plenty of chances to be launched into space. They have been prepared specially to count on the future. But now the heroes of the day are Aleksey Leonov and Valeriy Kubasov, and most of the questions during the meeting with the journalists accredited to the spaceport are addressed to them.

Press: "What is your opinion about the significance of this first international flight in the development of space research for the interests of all people on our planet?"

A. Leonov: "The main task of our flight is to accomplish the docking of the ships by means of the new standardized androgenous docking assembly. Testing of these assemblies in flight will make it possible in the future to use them for manned ships which, I am confident, will be launched from the territory not only of the Soviet Union and the United States but also other countries.

"The preparation of this flight is the first experience in cooperation between different countries to accomplish manned space flights; it will be of enormous importance to the future."

V. Kubasov: "The upcoming launch, in my opinion, should open up the way to international flights into outer space. This is the first step on a long journey. The testing of new standardized docking assemblies will make it possible in the future to render aid to spaceships that are in trouble. In the development of a rescue service it is advisable that at least the leading space powers combine forces. In addition, this flight will yield great benefits to world science."

A. Leonov adds: "Fourteen years ago, when Yuriy Gagarin was preparing for launch, here at the spaceport Baykonur resounded the words of the founder of cosmonautics Konstantin Eduardovich Tsiolkovskiy: 'Man will not always remain on earth but, in his pursuit of light and space, will at first tentatively penetrate beyond the bounds of the atmosphere and then conquer for himself all of solar space.' Tsiolkovskiy's dream of international space communities is now becoming a reality."

Press: You are flying into space from the same launch pad that was the start of flight of the world's first artificial satellite and the world's first cosmonaut Yuriy Gagarin. The technical supervisor of these flights was Academician Sergey Pavlovich Korolev. Will you please tell us what role he played in your personal career?"

A. Leonov: "That is a long and wonderful story. All of our life on the path to space is linked to the name of Sergey Pavlovich Korolev. I remember best of all two meetings. The first time was when we were invited to the mockup of the Voskhod-2. Sergey Pavlovich offered me the chance to perform the operation of moving from the ship into the lock and back. Whether that was coincidental or not I do not know. But I was happy and grateful for his trust. The dream of first going out into space then became the goal of my life.

"The second meeting was here at this same launch pad from which we will fly off into space. There were many people seeing us off. Korolev was very kind and calm. During a launch time is precious. He said only a few words: 'I ask but one thing. You, Lesha, just go out and enter the ship. May you sail on a favorable wind.'"

V. Kubasov: "I first met Sergey Pavlovich Korolev in 1958, when after graduating from the Moscow Aviation Institute I went to work in the design bureau which he headed. A young specialist just out of the institute, not yet a full-fledged engineer. Being tutored in the collective where he is beginning to work. S. P. Korolev was not only a talented and brilliant organizer but also a talented educator. He had enormous influence on me as an engineer during my probation period. He taught me to resolve my assigned tasks independently however difficult, and I am boundlessly grateful to him for this. I am also obligated to Sergey Pavlovich for my assignment in space. Literally just a few days after Gagarin's flight, Korolev in one of the

conversations expressed the thought that soon space flights would require not only pilots but also engineers and specialists in various professions. He said at the time: be careful, do not delay. We quickly gathered together an initiative group who had decided to become cosmonauts. I also made an application."

Press: "Aleksey Arkhipovich, undoubtedly you are getting lots of mail these days; would you please tell us about the most interesting letters."

A. Leonov: "Lots of letters are coming in these days. Not just from all parts of our country but from all other continents as well. All of the letters are very warm hearted. The people are expressing their joy that cooperation has begun in the exploration of the difficult territory of outerspace; they are sending their best wishes.

"Recently we had the opportunity to speak with our American colleagues twice. Tom Stafford, Vance Brand, and Deke Slayton told us in Russian, with very happy voices, that everything is going fine on their end."

EPAS and America

IZVESTIYA's Own Correspondent Vitaliy Kobysh Reports From New York

In the life of America, so pursuant of spectacles and accoustomed to advertising, the joint flight known as EPAS -- experimental Apollo-Soyuz flight -- has taken a prominent place. It does not fit into accoustomed ideas either from the standpoint of its scientific-technical value or, even moreso, its political significance. Regardless of how the experiment goes, whether the participants in the flight manage to complete 100 percent of the program, EPAS is a historic event for America. There is a clear understanding that it is not just a matter of linking up the Soyuz and Apollo, built in accordance with radically different designs, but also of a common striving toward cooperation, in this case the joint exploration of space, of achieving mutual understanding between nations, of curbing the arms race, of creating a peaceful climate on the planet.

"The flight has become possible only on the basis of relaxation, and it clearly demonstrates what can be achieved through cooperation," explains a person who is almost a prophet in this country, the CBS television commentator Walter Cronkite. "It would be, of course, naive to hope that just this program alone can bring to an end all of the conflicts between our two systems," said Donald Slayton at the last press conference with American astronauts. "But if we at least continue construction cooperation in this field, then undoubtedly we can avoid serious confrontation." At the same press conference Thomas Stafford said: "If we can work together to resolve this complex task, which requires a step-by-step approach and which involves a large number of people, then obviously we can resolve many other problems."

...Ten years ago there was a novel current in the United States by Martin Keylin [transliteration] concerning the first explorers of uninhabited worlds. Its protagonists were Soviet and American cosmonauts who were involved in a joint flight. The book was assigned to a genre that was not so much science as political fantasy. At that time hardly anyone would have thought that the Soviet Union and the United States would undertake a common venture directly relating to the use of rocket technology, a venture which would be inconceivable without mutual trust.

How quickly everything changes! At that time the play of the author's imagination took one's breath away. Today it does not seem such a flight of fancy. This is not, incidentally, to criticize Keylin: who could at that time have foreseen that a Soviet colonel and an American general would be flying into space together among others, that we would hear Russians speaking English and Americans speaking Russian in outerspace?

The epic as a whole and its component parts appear to the Americans to be full of deep symbolism. The cosmonauts and astronauts have not only worked well together -- they have also achieved a personal plane, having made friends with one another's families. In resolving deep difficult scientific-technical tasks, the Soviet and American scientists and engineers have learned to understand one another almost instantaneously. During the docking of the Soyuz and Apollo they will fly over the spot where a memorable meeting took place 30 years ago, but this place it will take place not on but above the Elbe. A little more than three hours after that General Stafford and Colonel Leonov will exchange handshakes and gifts in space: in accordance with an excellent idea of Stafford's these will be seeds of trees. At subsequent "banquets" the guests aboard the Soviet ship will get a taste of borsch, and from tubes rather than from China dishes; our cosmonauts, conversely, will be toasted with American potato and mushroom soup. Incidentally, when they gathered together for the last time at Leonov's place in Zvezdnyy, they drank half of a bottle of Vodka and then signed their names on the label and left the rest until their return to earth.

The American weekly magazine U.S. NEWS AND WORLD REPORT points out: "Looking into the future, scientists are talking about joint programs of constructing space cities which could become launching pads for flights to other planets of the solar system." Chester Lee, director of EPAS on the United States side, sees real prospects for combining efforts in exploring Mars. He predicts: "A future flight to Mars may be participated in by not just two countries but perhaps three, four, or more."

Into magnificent, cosmic affairs at times petty and mundane things intrude. For some people in the United States the Soyuz and Apollo flight is not to their liking: because of the fact that higher scientific-technical thinking is being utilized in this case not for purposes of war preparations but for peaceful cooperation, with the inevitable improvement of relationships between our nations associated with the program, and because EPAS is laying the groundwork for future possibly even more far-reaching joint projects. They have argued against the EPAS, claiming that it is no more than a

waste of funds. They have slandered the Soviet Union, claiming that we have engaged in this cooperation only in order to borrow United States technology. They have launched a continuing campaign to discredit the Soviet contribution to the common undertaking. Two weeks prior to the flight, Senator W. Proxmire stated blandly that the flight should be postponed because, in his opinion, the Soviet Union was not capable of simultaneously controlling the Soyuz and the Salyut-4 already in orbit. For his bad manners he got his comeuppance: American experts shamed the senator.

The American side is doing everything necessary to ensure the complete success of the program. The Apollo is ready for flight and the astronauts are too. "Everything is very o.k.," was the way General Stafford described the situation in his Russian. In recent days this "o.k." has been threatened by just one thing: the weather. Storms and hurricanes are raging over the United States. A tornado passed over the coast of Florida. A protective covering has been placed over the Apollo to prevent lightning strikes.

...I am in constant touch by telephone with the Houston Manned Flight Center and the Kennedy Center on Cape Canaveral, where the Apollo will be launched into space. Here are the latest conversations.

Houston, information service spokesman Milton Rin [transliteration] on the line: "Everything is going strictly according to plan. We are maintaining contact with centers in the Soviet Union. Having flown on Saturday from Houston to Cape Canaveral, Stafford, Slayton, and Brand were studying Russian up to the last moment."

Kennedy Center, Robert Gordon, who is responsible for relations with the press speaking: "The astronauts are undergoing their last training, which includes flights on a big T-38 jet, and they are going over the last details of the flight. The weather? According to forecasts, by launch time, on Tuesday, the storms should diminish slightly. We hope that nothing will prevent the launch from taking place on schedule."

American television is already on the job. The largest companies -- ABC, CBS, and NBC -- have thrown all of their best manpower "into space." The reporting will be done by several former astronauts, among others, including Admiral Alan Shepard. Tomorrow at 8 h. 20 min local time, America will see a direct broadcast of the Soyuz launch. Tomorrow the countdown begins: 9...5...2...1...--mankind will step into the era of joint space conquest.

The World Awaits News From Orbit. Report From the Moscow Press Center

The atmosphere in the Soyuz-Apollo flight press center is a familiar one to journalists. Somewhat noisy, crowded with people. This is where the latest news comes concerning the beginning of the ambitious space experiment.

In the spacious lobby alone a glass wall which looks out onto Gor'kiy Street, desks have been set up. There are nameplates on them. Academy of Sciences USSR. Press Division, Ministry of Foreign Affairs. American NASA. Here, consultants will provide instant, skilled information. I approach the NASA table: what is the name of the press center director in Houston? The young American answers quickly: "John Macleish."

Communications are continuous between Houston and Moscow, between the two flight press centers. Yesterday's pre-launch press conference in the Hotel Inturist was simultaneously relayed to Houston. And although it was night there, American colleagues extracted from the broadcast the most up-to-date news items concerning the last hours of preparation for the launch of the Soviet cosmonauts.

Today the 700 foreign and Soviet journalists accredited to the press center on Gor'kiy Street in Moscow have a very intense and busy day. News from the spaceport at Baykonur comes in constantly.

The American press corps in Moscow is well represented. Representatives of the largest American television companies have installed themselves on an open terrace of the press center under an awning. Telephone, teletype, and television lines have been installed especially for them.

Considerable credit for the fact that the press center in Moscow is operating so smoothly -- one might say, according to space schedule -- goes to the communications workers of the capital city. I had a conversation today with an extremely busy person -- T. V. Khanina. She is the deputy chief of Moscow's TsMTS [Central Long Distance Telephone Exchange]. But the foreign journalists have thought up their own name for her. And so Taisiya Vasil'yevna has become "Miss Communications."

In the past two days more than 200 international telephone calls have been made through the press center. And this is just the beginning. The final hours before the Soyuz launch, calls will increase to an avalanche.

The world is waiting for news about the flight. Everywhere, people are interested in the smallest details relating to the historic experiment in space. This is proved eloquently by the latest TASS dispatches from abroad. TASS Telex's have been installed in the press centers. Here are a few of the latest dispatches.

From Houston: All preparations for the launch of the American ship are successfully complete. The weather in the vicinity of the spaceport is favorable to a successful Apollo launch.

The Hungarian weekly NEPHADSEREG writes: "For the first time in history there will be a rendezvous of spaceships carrying the flags of different countries."

"A historic joint step between East and West," is the way the British newspaper SUNDAY TELGRAPH characterizes the upcoming flight.

M. Levi, president of the French National Space Research Center, has declared that the fact that the Soviet Union and the United States -- the two leaders in the field of space exploration -- have combined forces is cause for great satisfaction on the part of French scientists. The joint Soviet-American space experiment is of great international significance. It will help to promote the relaxation of tension throughout the world, and to expand mutually beneficial cooperation among countries having different social systems.

Journalists are rushing to be the first to dispatch the latest news of space to their editors. Undoubtedly, records will be set. Nevertheless, it is unlikely that any one of them will be able to "scoop" my old friend, the well-known Polish writer Jerzy Rakowski. A month ago in Warsaw his book came out dealing with the Soyuz-Apollo flight. The book sold out immediately.

Jerzy Rakowski was one of the first to submit a question for the upcoming onboard press conference. The press conference will be given on 18 July directly from space by American astronauts and Soviet cosmonauts. Here is the question submitted by the Polish journalist: "Hundreds of millions of people in all parts of the world look upon you as the heroes of 1975. Will you please tell us what mankind's future looks like?"

I do not know how the flight participants will answer this question, but all the people on earth believe and hope that if international cooperation continues to develop in the same spirit as the Soyuz-Apollo experiment, the planet is assured of a happy and peaceful future. A. Krivopalov.

Reinforcement in Space

Special IZVESTIYA Correspondent Andrey Ivakhnov Reports From the Flight Control Center

In the evening of 14 July, before going to bed, Cosmonauts P. Klimuk and V. Sevast'yanov asked the flight control center for authorization to begin the next working day approximately one hour earlier in order to have the opportunity to watch the beginning of the joint Soviet American space experiment -- the launch of our Soyuz.

This center in Yevpatoriya is involved only in the Salyut-4 flight. However, here and there television sets are turned on, and you can see the Soyuz rocket. Through the speakers you can hear the words of the reporters concerning the latest preparations. Like all the Soviet people, all the people throughout the world, we are awaiting this event excitedly.

And only two men -- two earthlings -- are deprived of the opportunity to sit up close to the television screen at the time of blastoff. They are the members of the Salyut-4 crew. But we were told by the on-duty flight director that each happening at Baykonur and then in Houston will be reported to P. Klimuk and V. Sevast'yanov during radio communications sessions. Shortly before the Soyuz launch we had a meeting with one of the directors of the command-measurement complex.

Question: How has the complex prepared itself to control simultaneously two very complex space experiments?

Answer: Indeed, we are faced with a job which has never been done in world practice. Two manned complexes, completely different missions, different specific features.

The preparations for the control of the Salyut-4 flight and EPAS required substantial technical and organizational measures. In particular, additional communications lines were hooked up and our scientific-measurement stations received new specialists as reinforcements.

Imagine: right now Salyut-4 is sending information to earth concerning more than 2,000 parameters. The information has to be processed instantly and particular decisions have to be made. After the Soyuz is launched the amount of information coming from space will increase by 1.5 times.

Naturally we were not able to organize things so that, for example, one group of scientific-measuring stations could track only the Salyut-4 while another could track the Soyuz and Apollo. And there was no necessity to do so. But we tried to organize things so that neither program would interfere with one another.

Our enormous collective, thousands of specialists working in various sections of the country and on ships many hundres of miles from our shores -- is all keenly aware of the importance of the EPAS Program; they are aware of their responsibility for the success of the undertaking. All of our thoughts are now directed toward the Baykonur and Cape Canaveral space ports. We are waiting for the joint flight and we are rooting for it. But at no time can we afford to let our attention flag with respect to the Salyut-4 and its heroic crew.

I am convinced that both experiments will adorn the pages of the world's space annals.

An Event of Historic Importance. Statement of the United States Ambassador to the Soviet Union W. Stoessel

The joint Soviet-American space experiment beginning on 15 July -- a flight of the Apollo and Soyuz ships -- is symbolic as an example of positive and specific American-Soviet cooperation, cooperation which is possible both for our two countries and for all countries of the world. This was the

statement by the United States Ambassador to the Soviet Union W. Stoessel in conversation with a TASS correspondent.

The idea of joint efforts in space, the ambassador emphasized, captures the imagination of people precisely because it requires thorough and detailed preparation in addition to the development of mutual trust. In addition, this kind of bold undertaking can hardly fail to strengthen our resolve to cooperate in many other spheres -- from arms control to an expansion of information exchange, which can lead to better mutual understanding and the creation of a better world for all people.

I am convinced that the Apollo-Soyuz flight will become a significant stage of our cooperation in the field of science and technology, W. Stoessel remarked. We are now working hand in hand on such problems as the development of energy resources, improving the environment, and combatting cancer and heart diseases. This cooperation is bringing enormous potential benefits not only to our countries but to all other nations. The Apollo-Soyuz flight should become a beacon which illuminates the necessity of working for the common good in all possible ways.

On the eve of the flight I am scheduled to fly to Baykonur together with my wife; I have heard much about it from our astronauts, said W. Stoessel in conclusion. We can hardly express the excitement and impatience with which we are awaiting this trip. For we will be attending an event of truly historic importance. (TASS).

Witnesses to a Great Accomplishment. Report from the Moscow Press Center.

In a display case at the entrance of the Hotel Inturist on Gor'kiy Street is a "photo window of space." It tells of the training of the Soviet cosmonauts and American astronauts for the joint flight in accordance with the Soyuz-Apollo program. It is a symbol of the fact that the flight press center is located here and has already gone into operation.

The pre-launch press conference was opened by V. N. Sofinskiy, supervisor of the press division of the Ministry of Foreign Affairs USSR. The meeting lasted about two and one-half hours, involving several hundred foreign and Soviet journalists.

The journalists gathered there were given a detailed account of the purposes and tasks of the preparation of the Soviet cosmonauts for this space experiment and its results by Academician B. Petrov, chairman of the Interkosmos Council of the Academy of Sciences USSR; twice Hero fo the Soviet Union A. Yeliseyev, flight director on the Soviet side; twice Hero of the Soviet Union A. Nikolayev, deputy chief of the cosmonaut training center; and Deputy Technical Director V. Timchenko.

After that came the questions. There were many. They demonstrated once more the enormous amount of interest evoked by the upcoming Soyuz and Apollo flight.

Will there be "exchange dinners" in space, and what can you say about the menu?

"Wait a while; such meetings are planned.

What will the current Salyut crew be doing during the joint flight?

"It will continue its own work. Whereas the Soviet space station is in orbit at an altitude of about 350 km, the Soyuz and Apollo orbit will be at an altitude of about 220 km. Moreover, they are flying at different speeds. Salyut will be flying above the Apollo and Soyuz; radio communications and mutual observation will be possible."

At the time the press conference in Moscow was coming to an end, in Houston, which has its own operational press center, it was about 4 o'clock in the morning. For this reason the journalists who were gathered together in Moscow's Hotel Inturist were the first to find out about the statement made by United Nations General Secretary Kurt Waldheim. Here is what he says:

"The Soyuz-Apollo space flight is an outstanding and inspiring event. Flights of Soviet and American cosmonauts and astronauts, opening up the way into space, represent one of the great accomplishments of our century.

"The Soyuz-Apollo flight is adding a new dimension to the exploration of outerspace. The space docking of American and Soviet cosmonauts and astronauts requires the greatest possible level of preparation, cooperation, expertise, and mutual understanding. It also convincingly demonstrates the will of these two countries to work together for human progress and is an inspirational factor in the United Nations' efforts for peaceful uses of outerspace."

Millions of people in all parts of the world are wishing the cosmonauts success; in a few hours they will witness one of the greatest accomplishments of our time. A. Krivopalov.

A. Leonov, T. Stafford: Ready for Flight!

TASS Commentator Talks With Crew Commanders A. Leonov and T. Stafford in the Yu. A. Gagarin Cosmonaut Training Center During the Concluding Pre-Flight Training Sessions

"Would you please name the basic stages of the joint experiment."

A. Leonov: "First it is worthwhile to mention the basic goals of the upcoming space effort, then these stages will become more clear. During the Soyuz

and Apollo flight, which is of course experimental, we will check out the technical capabilities of compatible rendezvous and docking devices between spaceships of different systems. This is of great importance for future cosmonautics."

T. Stafford: "If I may add to what Aleksey Leonov has said, I might mention that we are scheduled not only to test the rendezvous system and the docking assembly itself but also to learn to pass from one ship to the other and to carry out joint scientific and technical experiments."

A. Leonov: "All of this is for the sake of high level science, as we are justified in calling cosmonautics, and also for the purpose of making it possible in case of necessity for the crew of one spaceship to render perhaps emergency aid to the other."

"And now, perhaps, may I have an answer to my first question?"

A. Leonov: "Launch is scheduled for 15 July. The schedule of preparations for it is being strictly complied with."

T. Stafford (in Russian): "Everything is going smooth as butter. I am confident that it will be the same on 15 July. Excuse me, I interrupted you..."

A. Leonov: "On entering space the crews will set about achieving what is called link-up orbit. It will be circular, at an altitude of 225 km. There we will complete the second stage..."

T. Stafford: "The main thing is the docking of our ships. But first we will have to 'catch sight of' the Soviet ship somewhere at a distance of 450 km. The Apollo and Soyuz have special equipment for this. Gradually the Apollo will come up..."

A. Leonov: "Will approach..."

T. Stafford: "Yes, will approach the Soyuz. All of these maneuvers will be accomplished by means of automated equipment. At 50 to 30 meters we will begin the process of docking by means of manual control. Finally the ships will bump gently together. The androgenous docking assemblies will go into action. The international Soyuz-Apollo complex will come into being in orbit."

A. Leonov: "We will report to earth on the accomplishment of the docking and we will begin the third stage of our experiment. The essence of it is for the members of the crews to pass from one ship to the other. First, Thomas Stafford and Donald Slayton will come to visit us. We will be together two hours -- we will do some work and exchange our countries' flags. We will have dinner."

T. Stafford: "We will sign a joint document about the first international docking in space. On the second day we will have Aleksey Leonov over to visit us on the Apollo, and Vance Brand will go to visit Valeriy Kubasov. Later on Aleksey Leonov and I will pass over into the Soyuz while Brand and Kubasov will come into the Apollo."

"What souvenirs will you exchange?"

T. Stafford (in Russian, smiling): "That is a big secret!"

A Leonov: "We will give each other little cases containing the seeds of different varieties of trees. Commemorative medals have been struck for the flight, divided into two halves. Each crew will get the missing half. In addition, we will use small metal plates to put together two commemorative plaques showing the state flags of the Soviet Union and the United States. Each of them will give the date of the docking of the ships."

T. Stafford: "I should like to return to the question about the purposes of the docking. As Aleksey Leonov has said, it has direct relevance to the problem of rendering aid to a crew which is in trouble. It is extremely important to test the equipment for passing from onboard one ship to another in such a case."

A. Leonov: "That's right; this is the humanitarian aspect of the experiment, its importance for future cosmonautics."

T. Stafford: "This ships' docking and the visits are fine. But that's not all. Every spaceflight costs a lot. Scientific experiments will yield benefits for science on earth."

"Would you mention the main ones."

T. Stafford: "Each one of them is very interesting and undoubtedly vital to some particular field of knowledge. The 'ultraviolet absorption' experiment may provide an answer to certain as yet unclear problems of the physics of the upper atmosphere of earth. Soviet scientists proposed, and the Americans supported them, the idea of organizing a solar eclipse on 19 July. This is the way it will work: when our ship undocks from the Soyuz, it will block out the sun, and at that moment the Russian crew will photograph the solar corona at various distances within the range of 220 meters from us. These will be unique photographs, without interference from earth's reflected light and other factors."

A. Leonov: "Thomas, you forgot to mention one joint experiment..."

T. Stafford: "I purposefully left the 'universal furnace' to you, Aleksey. Your flight engineer is a specialist in the field of welding metals in space."

"Of all of the experiments included in the program is the fusion of metals most relevant to earth's needs?"

A. Leonov: "Yes: you know that Valeriy Kubasov was the first to conduct experiments in electric welding in space. This time an American-designed smelter installed in the passage block will be used to achieve a temperature on the order of 1,100° Celsius. A scientific program and the methodology of the Soviet part of the research with this furnace was developed in the Institute of Metallurgy, Academy of Sciences USSR. It will be to determine the possibility of using weightlessness and vacuum to produce new materials -- both metallic and semiconductor. In the opinion of Soviet and American scientists, it will be possible in space to smelt components that cannot be mixed on earth and to develop heat-proof materials..."

T. Stafford: "I should like to add that our astronauts onboard the orbital station Skylab conducted experiments in growing crystals of indium antimonide. They succeeded in producing a crystal that was purer and tougher than any crystals artificially produced on earth. This is encouraging."

A. Leonov: "Specialists believe that it is possible to produce a foam seal that will be light as wood and glass of ideal purity for optical purity."

"Production operations in outerspace: do you think this will become a practical undertaking in the near future?"

A. Leonov: "The development of orbital space factories is not far off. We are already justified in stating that space is with increasing vigor paying us back for the expenses incurred in exploring it. In this regard Academician B. N. Petrov was right when he said: 'Cosmonautics is beginning to provide earth abundantly with a great deal that is new and valuable and essential in response to that which earth has given cosmonautics.'"

T. Stafford: "And there is something else we should remember. Whereas 100 years ago it was believed that our planet was fabulously rich in resources, today the scientists are anxiously speaking of its limits. Mankind is counting on utilizing the resources of heavenly bodies for our needs."

A. Leonov: "Academician Sergey Pavlovich Korolev, who figuratively speaking led us by the hand out into space, said something like this during the years of the first launches of spaceships: 'Mankind reminds me of a fool who, having decided to warm himself, tears down the walls of his own home for firewood instead of going out into the woods for it.' But undoubtedly it will take the efforts of many nations to organize production operations in space."

T. Stafford: "That's right. It will not be easy, but it seems to me that the tempo is quickening. The cooperation of the largest space powers -- the United States and the Soviet Union -- in space will set a good example for others."

"Before I flew to Moscow I took part in the annual conference of the Astronautics Society. It dealt with cooperation between our countries in space and our upcoming flight. Talks were given there by Frank Moss, chairman of the Senate Committee on Aeronautics and Space Exploration, Soviet Ambassador Mr. Dobrynin, and others."

A. Leonov: "And Thomas Stafford..."

T. Stafford: "I was there too. All of the speakers remarked on the importance of the upcoming joint flight for strengthening Soviet-American cooperation in space not only for the two countries but also for world science."

"After the onboard scientific experiments are completed the ships will undock..."

T. Stafford: "And then we will carry out the experiments we mentioned -- the 'Artificial Solar Eclipse.' After completing that there will be a second docking. Whereas the Apollo's docking module played the active role during the first docking, during the second docking this function will be carried out by the docking assembly of the Soyuz and my colleagues Aleksey Leonov and Valeriy Kubasov."

A Leonov: "Then comes the fourth stage -- the final undocking of the ships. After that we will carry out the 'Ultraviolet Absorption' experiment."

"Let's return to today. I should like to hear the opinion of the crew commanders about the new equipment that the ships are provided with, about the contribution of the scientists, designers, and specialists to the upcoming experiment."

A Leonov: "Valeriy Kubasov and I along with the members of other Soviet crews have become well acquainted with the Apollo and its systems, and especially the part which is essential in the joint flight. The lock chamber for passing from one ship to the other, the pressure maintenance system, and the 'Universal Furnace' are made in a unique fashion and very reliable. As for the major technological innovation -- the androgenous docking assembly -- it is qualitatively different from all its predecessors, being a more sophisticated device. This represents to the highest degree a fusion of engineering talent and the experience of the designers of both countries. At the same time, the Soyuz and Apollo docking assemblies have a substantial design difference."

T. Stafford: "I like the Soyuz. It has all of the qualities that are essential for joint operations with the Apollo. The best confirmation of that is the voyage of the Soyuz-16 which was piloted by Anatoliy Filipchenko and Nikolay Rukavishnikov. Our specialists observed that flight and evaluated it highly. The Soyuz-16 program was maximally similar to the upcoming experiment in space. We may conclude that the cooperation of the American and Soviet specialists taking part in the development of the docking assembly have proved to be extremely fruitful. The joint efforts have mutually benefitted the specialists of both countries as well as cosmonautics."

A. Leonov: "Let us hope that the technical base developed by Soviet and American specialists during preparations for our flight, and the climate of friendship which characterizes relationships between all participants in the Soyuz-Apollo Program, will lay the groundwork for further major international scientific space experiments and will help to strengthen peace on earth."

T. Stafford: "We are completely satisfied with the work that has been done. It has once again confirmed that we are ready for the flight."

A. Leonov: "We are ready for the launch. In conclusion I should like to say that the upcoming joint flight is a genuine confirmation of the improving international climate, which has become possible thanks to the steadfast and goal-directed activity of the CPSU, the Soviet government, and General Secretary of the CC CPSU Comrade L. I. Brezhnev personally. Increasingly visible are the fruits of the agreement concluded in May of 1972 between the Soviet Union and the United States of America on cooperation in the exploration and utilization of outerspace for peaceful purposes. The international community justifiably views the Soviet-American experiment not only as a docking of the Soyuz and Apollo ships but also as an interaction between two sciences, two great nations, whose mutual understanding and goodwill will largely determine the chances for peace on planet earth." A. Romanov.

Hours of Waiting. Special IZVESTIYA Correspondent Bronislav Koltovoy Reports From Houston

The digital display in the rooms of the space center are counting down the last hours before the beginning of history's first international manned flight into space. At 15 hr 20 min Moscow time the whole planet will hear the manmade thunder generated by the powerful engines of the rocket carrying the Soyuz into earth orbit. Seven and one-half hours later, at 22 hr 50 min Moscow time, the roar of the Saturn-1B carrier rocket will respond across the ocean from Cape Canaveral; it will pursue our cosmonauts, carrying the American astronauts T. Stafford, V. Brand, and D. Slayton. On 17 July these five brave men are scheduled to meet high above Europe. This

rendezvous, like the two-day joint flight of the ships and the "exchange visits" of the cosmonauts and the scientific experiments, will crown three years of harmonious work on the part of scientists and specialists of the Soviet Union and the United States of America.

The final hours before launch. In the American press center, which is located on the grounds of the space center, resounds everywhere with the sounds of typewriters. Journalists who have flown in from dozens of countries are leafing through the information bulletins collecting material to report on the events of the coming day. Television and motion picture documentary reporters, bathed in sweat, are lugging their equipment around. But the main flood of the writing and picture-taking brotherhood is expected to come here the following day, after the launch -- the people will come who are interested in the docking. What is taking place there now, at the launch pad, where the rocket topped with the spaceship Apollo has been standing since the end of March?

Let's begin...with the weather. If the heat which now prevails at Baykonur can be compared with a Finnish sauna, the weather in Houston deserves to be compared to a Russian steamroom. As is the custom, after a steambath a shower is in order. And in the evening of 14 July a deafening thunderstorm accompanied by a tropical downpour broke above Houston where the Johnson Space Center is located. The sky above the launch pad was also at the mercy of lightning.

It should be mentioned that thunderstorms over the launching area in recent days have been cause for considerable concern among all participants in the preparation for the flight. Lightning has already struck the launch pad twice without, fortunately, causing any damage either to the rocket or to the spaceship. For very good reason the launch pad operators have been concerned with developing a new and more reliable system for protecting the rocket and ship from lightning.

The day before the launch a press conference was held on Cape Kennedy at the Kennedy Space Center. It was opened by Chester Lee, the director of the Apollo-Soyuz Program on the American side. He thanked the thousands of workers of the launch complex who had done so much to prepare for the blastoff.

Thomas Stafford, Donald Slayton, and Vance Brand, who flew to Cape Canaveral on 12 July, devoted their remaining days to a final polishing of their operation program during the flight and to the Russian language. Astronaut John Young, who is responsible for their pre-launch preparation, jokingly complains: "They are always talking in Russian and I don't understand anyting."

The countdown of the flight time in the joint Soyuz-Apollo flight will begin with the launch in Baykonur. From that moment until splashdown of the Apollo in the Pacific Ocean the Houston flight control center will go into 24-hr operations. Soviet specialists who have already flown to Houston will be working side by side with their American colleagues.

Before the feverishly busy hours (or more accurately days) began we were able to talk with the director of the Soviet group at the Houston Control Center, Candidate of Technical Sciences O. Bobkov.

"The center is ready to go into operation," he said. "Of course the staff has checked the condition of all the systems 100 times -- from computers to headphones. Our group will consult with the workers of the center on all questions relating to the Soyuz ship. We have with us ballistics experts, specialists on various ships' systems, and a representative of the cosmonaut training center. An American group of specialists of exactly the same kind is now at the Moscow Flight Control Center. This direct contact is very useful. During the training sessions we became especially convinced that telephone conversations cannot take the place of direct contact between people. We have all been working for a long time with our American colleagues; we have become friends and we understand one another, so to speak, instantaneously. This is a vital precondition for success in such a vital and crucial operation as the control of a space flight.

"For a man who has been to the United States many times it is easy to notice that the Soviet-American space launch effort is occupying the minds and hearts of many people besides those participating in preparations. Without exaggeration we may say that all America is waiting for this event with mounting interest.

"This interest is not due merely to the technical meaning of the experiment. Let me quote a lead article printed today in the NEW YORK TIMES: 'Hundreds of millions of people are wishing a bon voyage, successful flight, and safe return home to the astronauts which will represent all mankind when they get together in peace and friendship during the historic docking of the two spaceships.'

"In one of the television broadcasts dealing with the Soyuz-Apollo flight, the commentator in my opinion, defined precisely the main reason for the popularity of the upcoming event. Translating the Russian word Soyuz into English, he said that the Russians have made a happy choice in the name they gave to their spaceship. It expresses the very essence of the entire joint experiment and the idea of cooepration between the two nations."

We certainly must agree with these words. Relaxation of tension on earth travels many paths. One of them runs through space.

Bon voyage, Soyuz and Apollo!

CHAPTER 4. RENDEZVOUS IN ORBIT

15 July 1975 -- A Day of Launches. TASS Bulletin

On 15 July 1975 at 15 hr 20 min Moscow time the Soviet Union launched the Soyuz-19 spaceship. It is being piloted by a crew headed by Ship Commander Hero of the Soviet Union USSR Cosmonaut Pilot Colonel Aleksiy Arkhipovich Leonov and Flight Engineer Hero of the Soviet Union USSR Cosmonaut Pilot Candidate of Technical Sciences Valeriy Nikolayevich Kubasov.

This flight marks the beginning of the first major joint scientific experiment in the history of cosmonautics within the Soyuz-Apollo Program, carried out by the Soviet Union and the United States. The flight is being carried out in accordance with the "Agreement Between the Union of Soviet Socialist Republics and the United States of America Concerning Cooperation in the Exploration and Utilization of Outer Space for Peaceful Purposes" dated 24 May 1972, which calls for implementing efforts to develop compatible rendezvous and docking devices for Soviet and American manned spaceships and stations for purposes of improving the safety of manned space flights and making it possible to carry out future joint scientific experiments.

The program of the six-day flight of the Soyuz-19 spaceship includes:

-- testing of compatible rendezvous and docking devices developed by Soviet and American specialists;

-- accomplishment of docking with the Apollo spaceship and joint flight for a period of two days;

-- exchange visits of the cosmonauts from ship to ship and the conduct of joint scientific experiments during the flight;

-- the carrying out of scientific experiments during the independent flight of the Soyuz-19 spaceship.

The Soyuz-19 ship carries onboard the flag of the United Nations, which has made an important contribution toward seeing to it that space always serves the good of mankind.

After the ships dock in earth orbit the flag will be transferred to the American crew, who will deliver it back to earth. After that the Soviet and American space researchers will convey the flag to the United Nations.

Control of the flight of the Soyuz-19 spaceship will be in the hands of the Soviet control center with the aid of tracking stations located within the Soviet Union and the scientific-research ships of the Academy of Sciences USSR "Kosmonavt Yuriy Gagarin" and "Akademik Sergey Korolev," which are located in the Atlantic Ocean.

Constant communications will be maintained with the ships' crew. All onboard systems of the ship are working normally.

Cosmonauts Aleksey Leonov and Valeriy Kubasov feel fine and have begun to carry out the flight program.

Houston Flight Control Center, 15 July. (Special TASS correspondent). Today at 20 hr 50 min Moscow time, in accordance with the program of joint Soviet-American space experiments, the Kennedy Space Flight Center on Cape Canaveral launched the American spaceship Apollo. Onboard the ship is a crew consisting of Thomas Stafford (the ship's commander), Vance Brand, and Donald Slayton.

The Saturn-1B two-stage carrier rocket carried the ship into the initial orbit which was close to the designated one. After entering orbit the Apollo separated from the last stage of the carrier rocket.

According to a news bulletin from the flight control center, the members of the crew are in excellent condition. They have set about the task of checking the onboard equipment and preparing to complete a series of maneuvers to bring the ship into link-up orbit.

The most important part of the joint Soyuz-Apollo Program will be the docking of the two ships which is scheduled for 17 July while over Europe. During the joint flight of the two ships, which will last for two days, the cosmonauts will pass four times from one ship to the other and will conduct a series of scientific experiments.

T. Stafford announced before the flight: "We are confident that the upcoming Soviet-American space flight will strengthen ties of friendship between our two countries."

Moscow Flight Control Center, 15 July (TASS). By 19 hr 34 min Moscow time the Soyuz-19 spaceship had completed three orbits around earth.

The parameters of the orbit of the ship are as follows:

-- maximum distance from earth's surface: 221.2 km;

-- minimum distance from earth's surface: 186 km;

-- orbital period: 88.5 min;

-- orbital inclination: 51.8°.

The Soyuz-19 spaceship has received the program for carrying out the first maneuver, to be completed on the fifth orbit of the flight for purposes of going into link-up orbit.

The ship's flight is proceeding in accordance with the program. The health condition of cosmonauts Aleksey Leonov and Valeriy Kubasov is excellent.

Two out of 250 Million. Special IZVESTIYA Correspondent Boris Konovalov Reports From the Baykonur Space Port

The motorbus enters the launch pad area. Two figures in spacesuits jump out onto the concrete and, slightly stooping because of their spaceman's clothing which is unsuited for walking on earth, they walk up to the people who are gathered on this historic day at the foot of the rocket. And all of us, as if spellbound, gaze upon the last steps of these earthlings before being launched into the sky. The final steps of the Soyuz-Apollo project on earth. We are approaching the culmination of three years of effort on the part of Soviet and American specialists.

Aleksey Leonov reports: "The Soyuz-19 crew is ready for blastoff."

Their identification will be "Soyuz." During the first flight onboard the Voskhod-2 Leonov's identification name was "Almaz." By tradition, our commanders usually keep their previous identification name. This time the custom has been changed. Aleksey Leonov and Valeriy Kubasov are going on the first international flight. These two cosmonauts now represent our entire nation of 250 million. Their identification name is"Soyuz," and the spaceship itself is a part of the Soviet Union.

Leonov and Kubasov are two brilliant diamonds from the priceless treasure of the Soviet nation. Their destiny is a convincing example of the democracy of our society, which offers to all equal opportunities to prove themselves in any undertaking, which opens up to any of its citizens the way to reach the heights of knowledge, to achieve the most daring accomplishments.

Both of them are from families, so familiar to us all, in which the parents were hardly even literate, and yet their sons and daughters are working at the leading edge of modern science and technology.

Aleksey Leonov grew up in Siberia, in Kemerovo, the capital city of Kuzbass. There were nine children in the family. There was a time when the entire family lived in one room in the home of Leonov's older sister's husband. Sometimes there was not enough money, and yet they managed somehow to buy paint for him. Such is the customary attitude toward talent in our country that they felt that the lad might have a gift for painting. It is true that in his choice of profession another passion prevails -- the sky. First he became a pilot and then a cosmonaut; but he never abandoned his paintbrush. And as it turns out, this has been fortunate for his countrymen.

Aleksey Leonov became the first man on earth to step outside a spaceship into open space. He demonstrated to all mankind that man is capable of overcoming his fear of the unthinkable abyss of the universe, that he is capable of working there. I can remember now the excited gasps of the many thousands of people in the room when, after a press conference at Moscow State University, on the screen Leonov floated out of the hatch and for an instant blocked out the blinding sun, which immediately flashed reflections off his spacesuit in brilliant rays.

His steps out in space were steps on behalf of all mankind.

The little boy for whom they managed to find paints during the difficult post-war years brought back to earth the first drawings of "space scenery." Through his eyes the whole world could see our planet from space. The language of the artist is understood by all. And people on every continent gaze with equal enthusiasm on the bright gamut of colors of the sunsets and sunrises of space, they gazed with equal pride on the man hovering above the Black Sea with its haze of bluish-lavender. Although the helmet of his spaceship bore the letters USSR, everyone living on earth sensed an involvement in his feat, because together with him all mankind had walked out into open space.

In the career of flight engineer Kubasov, standing now next to the commander, we may trace the rapidity with which this country has ventured into space. His father was a ship's mechanic who sailed the rivers on slow-moving paddlewheel steamers. When Valeriy graduated from school, people everywhere were saying: "This is the age of aviation." He enrolled in an aircraft building course. It seemed that this was the place to start on the road to the most attractive accomplishments of the 20th Century, that this was the highest peak of the achievements of science and technology. But when he was graduating from the institute the first satellite was launched. The newspapers began to write that this was the age of space; the space era had begun. And then he himself became a cosmonaut.

This was not an idyllic path either for him or form our country. Behind the swiftness of a launch is the salty sweat of the selfless labor of millions of people, and sleepness nights spent mastering the subtlties of study. After the war he teamed up with one of his comrades to work at fishing. The two boys could do the work of one adult. The fish were essential, and there was not enough manpower in the fisheries.

In 20 years we had enough manpower to send automatic equipment to other planets. And the correction of the trajectories of the legendary Soviet Venera spaceships was accomplished by a method which V. Kubasov had helped to develop. Thus the son of a ship's mechanic became a specialist in celestial mechanics. And now he is about to take his second flithg on a ship controlled in accordance with the laws of that science.

Surrounded by a ring of people, through a chorus of good wishes and farewell speeches, the Soyuz-19 Commander Aleksey Leonov and Flight Engineer Valeriy Kubasov are moving toward the foot of the rocket where an open elevator awaits them. Climbing up onto the natural platform of a service girder, Leonov loudly and excitedly pronounces the crew's declaration prior to the historic launch into space. He says: "We are proud to have the honor of taking part in the first international manned flight..."

Final handshakes, embraces, and the elevator carries the crew aloft.

We ride over to the observation station two km from the launch pad. Many people have gathered there: scientists, designers, cosmonauts, space port specialists, representatives of the organizations who have prepared the flight, Academician B. N. Petrov, chairman of the Interkosmos Council of the Academy of Sciences USSR, and K. D. Bushuyev, corresponding member of the Academy of Sciences USSR and technical director of the Soyuz-Apollo Project on the Soviet side.

On the platform of the observation station of the Soviet space port are the United States Ambassador to the Soviet Union Walter J. Stoessel and representatives of the Ministry of Foreign Affairs USSR.

On the screens of the television sets we can see the launch crew calmly and methodically preparing the rocket for launching. People all over the world are watching this event.

In Zvezdnyy I asked Leonov and Kubasov what the main thing was in the profession of a cosmonaut -- what would the "ideal crew" be like.

"A space flight," said A. Leonov, "is the culmination of an enormous amount of work done by dozens of large scientific and production collectives. And if we probe further, in essence it involves the entire country, or in this case two countries. Enormous trust is placed in the cosmonauts, and they must justify it. Everyone must have a superb knowledge of his job and the entire program as a whole; everyone must be able to sense in every cell of his body what his comrade is doing, and always come to his aid if

necessary. You must feel like your comrade in flight is the other half of your own being. In order to do this you must not only understand one another's working characteristics but also one another's psychology. This can be done only after you have worked a long time together."

And here is the opinion of V. Kubasov:

"Probably the main thing is the responsibility which the cosmonaut bears. After all, during the days of the flight — especially a flight such as ours, the work of thousands of people come together in him. It is necessary to carry out impeccably that which has been years in preparation. It is necessary above all to know the equipment with which you are flying, to get your bearings in a difficult situation calmly and without panic and to find a way out of the situation. To put it figuratively, every member of the crew must have a cool head and common sense."

As you can see, their opinions coincide by and large. And this is completely natural for a crew which has worked together. Psychologists say that they complement one another. Leonov is a man who is more emotional and decisive, capable of rapidly getting his bearings in a specific situation and finding the optimal solution. He has demonstrated these qualities both in training and in real life situations. Early in his "space career" when training with a new parachute, one of the straps got tangled around Leonov's foot after he jumped out and he began to fall upside down.

He managed with difficulty to free his foot. But the strap got caught behind a piece of duralumin and he continued to plummet earthward in a horizontal position. This could have ended tragically, of course — the ground was only thirty meters below. But he managed to bend the metal piece with his hands and free the strap. Later on, on the ground, no one -- including him -- was able to bend it back. They had to use a hammer.

The well known artistic streak that Leonov shows in his profession as a cosmonaut, is especially well demonstrated in emergency situations when it is necessary to depart from the scheduled pattern and improvise. In such cases, Leonov invariably demonstrates quick reactions and sharpness of wit.

Flight Engineer Kubasov is one of those people who does not like to make hasty decisions. It is his nature to take the time to think things through, to weigh and assess all the possible consequences, and only then to act. And one may be confident that his decision will be well justified.

Now, when they are scheduled to test the new docking assembly, to work on two shifts, and to carry out a number of complex scientific experiments, a great deal in the flight depends on the flight engineer. According to the common opinion of the specialists who have prepared the flight, Kubasov has a thorough knowledge of both the Soviet and American equipment and research apparatus on board the ships. It is no accident that as early as the Soyuz-6 flight, during the group flight involving three ships, he was entrusted with history's first experiment in space welding. He was chosen because he had proved himself in his work in the design bureau to be an

exceptionally meticulous and hardworking researcher.

If one were to look for the fundamental core in the character of both men, undoubtedly it involves persistence and steadfastness. Before the flight, the main medical specialists, analyzing all the data, concluded that the health condition of Leonov now, at the age of forty, is the same as -- and in some respects even better than -- it was fifteen years ago when he had just become a cosmonaut.

Every day Aleksey Arkhipovich runs five kilometers. In all kinds of weather: winter, summer, during autumn slush and the wet spring fog. Five kilometers until he is sweaty enough to have to wring out his jersey, and then another one-half kilometer in the swimming pool. Someone figured out that in one year Aleksey Leonov has run two hundred long distance races, has pedaled about one thousand kilometers on a racing bike, and travelled three hundred kilometers on skis. And all this just in order to be ready for his main job -- the flight training and studies. Behind the brilliance of his fame is persistent hard work and enormous demands upon himself.

They began to prepare for this flight in May of 1973. Neither Leonov nor Kubasov knew a single word of English. In two years and two months they had to master English, the modified Soyuz, the new docking assembly, and -- the main thing -- the completely unfamiliar American spaceship the Apollo. Valeriy Kubasov told me that in his memory all of that time has become a solid blur of training and English studies. His hard work has been rewarded with success. He knows the language quite well now. A. Leonov, as is his amiable custom, even tries to make jokes in English.

It is said that people who live and work together for a long time finally come to resemble one another. In fact, Leonov and Kubasov obviously have something in common outwardly. Both of them are well built and stocky, similar to Russian mushrooms -- vigorous, without a single blemish.

Nevertheless, after even one conversation you can sense that these people are really different. Leonov is completely open and sociable; he establishes contact with people instantaneously. His animated ways and good nature are so powerful that almost any company in which he takes part as a rule instantly centers around him. It would seem that he emanates invisible waves of fascination.

Kubasov has a nice, kind smile, but it shows up on his face less frequently. Kubasov is somewhat slow moving and outwardly phlegmatic; he is very stingy with small talk which is, in his view, a waste of time. It takes time for him to get use to new people. On the other hand, once he trusts a person he gradually opens up. Then it turns out that Kubasov is not just a "dry stick" at all. Like Aleksey Leonov, he loves the Russian landscape very much. Especially his native Vyazniki, when the Klyaz'ma River overflows in the springtime and the trees stand "up to their knees" in water and the banks cannot be seen but only the tops of islands. Then the romantic appears, drawn by the lure of exploration and the thirst for discoveries.

When I asked him where he would go if he had a time-machine, he said he would visit the past and see who had chiseled the cave drawings that looked like spaceships and cosmonauts in spacesuits. Although we cannot yet prove it, he thinks that at one time there may have been visitors to earth. He himself dreams of going to Mars. After he defended his dissertation, which dealt with the mechanics of flights to Mars and Venus, his colleagues knowing about his dream presented him with a picture inscribed with the wish that he himself might fly on the trajectory he computed.

Despite his Martian strivings, however, he is so devoted to his family and children that people even joke about that. One favorite answer to the question "Where's Kubasov?" is: "Playing with Mit'ka." He has a son who was born in April 1971. Kubasov says that after flying this is the main event in his life. And, like everything in his life, he takes a serious approach to it. He tries to get away to be with his son every free minute. His daughter is now seven years old. He talks with her in amusing ways, in detail, and patiently; he tries to bring her up to his level.

Leonov is the opposite with his own daughters -- he gets involved so much in the children's role that he gets carried away himself and plays like a child. Incidentally, even among adults he behaves in a very direct manner. This is impressive to everyone. In Zvezdnyy he enjoys a sincere affection and prestige.

Over the span of fiteen years in space work, Leonov has imperceptively changed from being "Lesha" among his comrades to being "Arkhipych." It's not a matter of age, for some people will be called Lesha all their lives. It is, rather, a tribute of respect for the seriousness which he undertakes training sessions, the sincerity and responsiveness of this man, a particular sign of gratitude for the many large and small favors which he has managed to accomplish for the town of Zvezdnyy.

Leonov is one of the "Gagarin Guard" cosmonauts, and he remains one of the main preservers of the old traditions, the spirit of genuine comradeship, mutual help, and a happy, cheerful approach to life. Every New Years all of our cosmonauts get together to celebrate like a family, and one of the nicest surprises is invariably a movie made by Aleksey Leonov with a hidden camera the previous New Years.

Friedrich Engels said that "an individual is characterized not only by what he does but how he does it." Aleksey Leonov impresses everyone that I talk to by the way he works and gets along with people -- cheerfully, jokingly, with invariable goodwill. And even in such a serious matter as space exploration these are extremely essential qualities.

Leonov and Kubasov are totally dedicated to cosmonautics; long ago it became the meaning of their life, their highest goal. Their profession is considered dangerous and, of course, they know this very well. This joint Soyuz and Apollo flight will be used to test devices which will help cosmonauts of different countries to come to the aid of one another.

When I spoke to Kubasov he recalled the history of aviation and the Wright brothers.

"You see, their father was a minister, and when they asked him one time whether men could fly in the air, he was horrified: 'only the angels can fly in heaven.' Yet his sons built an airplane. Of course, now we smile when we look at photographs of the first "flying shells," but after all they paved the way to modern aircraft. Space technology has just begun its path. But, having opened the way into space, mankind will not stop there. Understanding is the major motive force in the development of our civilization. Modern science has two main ways to seek knowledge -- one leads into the depths of the microworld; the other leads into the depths of space. And I am happy that we will make one more step along this road together with the American astronauts."

... Like wings the two halves of the service girder fold back, revealing the trim, snow-white body of the rocket.

"Launching switch!"

"Pull one."

"Pull two."

The familiar pre-launch commands resounds loudly above the boundless steppes. The Baykonur steppe heard the commands when the first Sputnik rose into space, when Yuriy Gagarin went up, and when Aleksey Leonov went up to become the first man in history to walk in space. This steppe has heard many such historic "firsts."

People frequently extol the past and undervalue the present. However, brilliant the flights which the launch area before our days has seen, today's flight will resound no less loudly in history.

This launch opens up an era of international space flights.

The last umbilical falls away -- the final cord connecting the rocket to earth.

"Ignition!"

"Blast off."

And with a transit roar, riding on a blinding white sun, the rocket speeds up into the boundless blue of the sky over Baykonur.

Great Launches

Special IZVESTIYA Correspondent Bronislav Koltovoy reports from Houston.

Early on the morning of 15 July, the United States President G. Ford went to the State Department Building in order to announce a message of greetings to the American Astronauts and the Soviet Cosmonauts before the start of the Soyuz-Apollo flight. Two space launches, united by the common goal of the joint flight, last night attracted the attention of millions of Americans.

In houston it was seven hours twenty minutes in the morning when the Soviet spaceship was launched. "Right on schedule! Everything is going superbly, History's first international flight in orbit has become a reality," was the report given by commentators to American viewers who were witnessing the launch in Baykonur. The American astronauts also saw the launch. They saw the video tape from Baykonur during their pre-launch breakfast.

Now it was Apollo's turn. The day before, all of the hotels and camp grounds in Florida were packed with tourists and guests who had been invited to watch the launch of the giant Saturn-1B rocket, with Apollo on top.

On launch day, the sky cleared and the thunderstorms moved far off, and with them the agitation of recent days. Two hours and forty minutes before blastoff, the astronauts, dressed in white spacesuits, crossed the threshold of their home in space, where they would soon be receiving the Soviet cosmonauts as guests.

The tedious minutes of the last two hours dragged on, and then the seconds ... there was a burst of white flame, rivaling in brightness the southern sun suspended over Cape Canaveral. The flame expanded rapidly. It was the first stage engine becoming operational. Another instant -- and the rocket smoothly went into motion. Having witnessed two launches on one day, I could not help but pay attention to the fact that both in the preparations and in the actual routine of the launch there was much that was similar. This made even more obvious the fact that cooperation in orbit is natural.

Among the honored guests at the Kennedy Space Center on Cape Canaveral was the USSR Ambassador to the United States A. Dobrynin. After the launch he warmly congratulated the people who had participated in preparing for the flight.

The launch commands of the two sides, and the unanimous opinion of specialists, were executed brilliantly. The flight schedule was complied with down to the second.

And now, a few words about the astronauts aboard the Apollo.

When we asked the director of the Houston Manned Space Flight Center Christopher Kraft how they selected astronauts for the joint Apollo-Soyuz flight, he smiled slightly and answered:

"I was the one to propose candidates for this crucial flight. I nominated the most experienced people, those who had been on the team longest, those who had made the greatest contribution to our space program. All three of them have been test pilots in the past; they know the equipment superbly and are dedicated to the exploration of space. They don't lose their heads in unforseen circumstances. Otherwise they are ordinary people. In the long run, an astronaut is an earthly profession."

It is no exaggeration to say that the choice of the American three-man team is an excellent one. These are true veterans who have passed many tests, some of them severe ones.

Thomas Stafford, the commander of the Apollo, is already fairly well known to our readers. This is the fourth time this tall, calm, healthy fellow has been launched into the vastness of space. He has behind him two hundred ninety hours in space and five dockings in orbit. That is pretty good experience to prepare him for the rendezvous with the Soyuz. Stafford has faced danger many times. I will mention one episode.

In 1969 he flew to the moon as the commander of Apollo-10. This voyage was the last test of the ship prior to landing on the moon. Together with his comrades on the flight, Stafford went into lunar orbit. Then the lunar module separated from the main module and descended to about fifteen kilometers from the surface in order to rehearse the landing and takeoff from the moon. But after the scheduled program of separating the landing stage from the lunar module, the takeoff capsule off by itself unexpectedly began to rotate out of control. In order to reimpose control on the capsule's stabilization system and return safely to lunar orbit it was necessary to have steel nerves and a thorough knowledge of the equipment. Stafford proved that he had both those qualities.

The commander's colleagues are going into space for the first time. But you cannot call them novices. Vance Brand -- the pilot of the Apollo's command module, whom our cosmonauts have christened Vanya -- is also a veteran of the team. This smiling fellow has yearned for the skies since he was a boy. His dream led him first to be a pilot of a jet-fighter. Then he joined Lockheed Aircraft, where he tested new aircraft, and finally he joined the astronauts team.

For a long time he "had no luck": Since 1966 he has been on back-up teams five times: Three times on Apollo flights, two times on Skylab Crews. Naturally, it was disappointing to remain on earth so many times after many months of training and to be a veteran back-up pilot. But Brand passed this test on character without losing his optimism or his persistence

The path to the stars has been even more difficult for the pilot of the docking module Donald Slayton, the elder among the American astronauts. I would call this grey-haired veteran, who looks more like a scholar than a pilot, a Spartan both in form and substance. First of all, he was born in Sparta (there is a town called that in the state of Wisconsin). But most of all, he has demonstrated true Spartan bravery and steadfastness

In his striving towards space. Judge for yourself. Slayton was among the first seven pilots who starting in 1959 became the nucleus of the American astronaut team. It was assumed that he would pilot the Mercury (this was the name of the very first 1-man spaceships launched in America) but in August of that year, implacable physicians rejected him because of a heart disorder.

One may easily imagine how Slayton suffered from this medical verdict. Remaining on earth, he continued to serve the cause of space exploration in the Houston Manned Space Flight Center. Through his hands passed all of the astronaut candidates (among them, incidentally, Stafford and Brand), he directed their flight training. And through all those years Slayton followed a rigorous regime which was directed at a single goal: to get back on the astronauts team. Every day for ten years he continued to practice running and gymnastics in accordance with a program worked out by doctors, also a long-term course of treatment. What this cost him the astronaut himself does not like to say; in general he is a man of few words. But at long last the unbelievable happened: One time Donald went to the doctors, and they could hardly recognize his heart -- there was not a single defect. Slayton was again included in the team and began to prepare for the joint Apollo-Soyuz flight.

Each astronaut has behind him more than two thousand hours of training in the flight program. They not only have a thorough knowledge of the Apollo system, but also have a fairly good understanding of the Soyuz. In addition, each has spent seven hundred hours studying Russian. It is true that strict sticklers for pure pronunciation might give Stafford a low grade for his Oklahoma accent. But the important thing is that A. Leonov understands very well everything that the Apollo commander says in Russian. That's the main thing.

Distant Baykonur showed on the colored screen. The Moscow Flight Press Center was receiving direct broadcasts from the launch area. Tension was mounting every second. A representative from Africa sitting next to us (later on he introduced himself as a journalist from Sierre Leone) kept asking questions of one of us. He did not know Russian very well yet, and all details of the launch, apparently, not only interested him but excited him:

"How are things going there? How do they feel? Already in orbit? Congratulations!" Our colleague from Africa was immoderately hasty.

When the white rocket with the red stripe finally rose swiftly upward, warm applause broke out in the Moscow Press Center. All of those present clapped their hands and congratulated one another. The event which had been awaited so long and prepared for so long had been accomplished.

Late in the evening of 15 July, before the launch of the Apollo, the Moscow Press Center again became crowded. And again, the journalists were well served by up-to-date communication equipment. The screens of

the colored television sets made it possible in a literal sense to watch the exciting launch of the Apollo from at least four locations simultaneously: the Apollo cabin, the Houston Flight Control Center, the area around the launch complex at Cape Canaveral, and the operations room of the Moscow Flight Control Center. But very likely the dominant sensation which prevailed in the halls of the press center was not just the fact that all of this we're witnessing was an extraordinary event, but also that this was the beginning of the implementation of the first international project the scale of which would only recently have seemed to be Etopian.

We watched while the flight director Aleksey Yeliseyev in the control center near Moscow watched the preparations for the Saturn launch with the same attentiveness as during the launch of the Soyuz-19. While in Houston, in the same room where the flight director on the American side Pete Frank was giving the final instructions to the Apollo crew, a group of Soviet specialists were sitting at control panels. Yesterday's launches were truly joint efforts ...

On 16 July at ten hours five minutes in the morning the loud speakers in the press center announced the information from the Moscow Flight Control Center involved in the Apollo-Soyuz program: in fifteen minutes the Soyuz-19 would begin the thirteenth orbit.

The astronauts went into a routine of ordinary working days. The director of the Moscow press center V. N. Sofinski in a routine briefing for foreign and Soviet journalists reported on the maneuvers which our spaceship had carried out to prepare for the docking with the Apollo. This information was simultaneously relayed to the Houston press center.

The specific characteristics of the Soyuz-Apollo flight and its international significance brought to Moscow those days many imminent foreign political commentators. One of them, Andras Sugar, a commentator on Hungarian radio and television, expressed a very appropriate thought: "This is the beginning of joint efforts by representatives of two different social systems in space. It is for this very reason that the people of our planet are coming to a deeper understanding of what they have in common; they realize that, after all, we are all earthlings."
A. Krivopalov, M. Rostarchuk.

Have a good flight, fellows!

Mankind will surely never forget the day when we completed our first step into space, which was at that time mysterious and unknown. I have a special recollection of that day because I was in unusual circumstances at the time. In an enormous and overcrowded hall in Leipzig, where the World Congress of Trade Unions was in progress, representatives of workers from all over the world were discussing the urgent problems of the labor movement.

Presiding was Louis Sayan [transliteration], a red-cheeked cheerful Frenchman, who loved to flavor even the most important business with his sharp and capable Gallic wit. He opened the conference in the usual manner. The floor was turned over to the next speaker -- if I recall correctly, an African from Senegal -- and when the latter, had begun to speak, had the audience's attention, the chairman interrupted him:

"Excuse me, comrade, I will have to stop you and turn the floor over to an unscheduled speaker. The speaker is in a great hurry and cannot wait".

The multinational, multilingual congress fell silent. And suddenly you could hear the short, even, repeated sounds:

"Beep, beep, beep ..."

The people sat in astonished silence. What could this mean? These quite incomprehensible sounds -- beep, beep, beep -- continued insistently and stubbornly to penetrate the tense silence.

And then the presiding chairman reported that for the first time in history, the Soviet people had managed to launch into space a man made apparatus, and that the planet Earth had been enriched by another small moon -- a man made satellite -- and that this sputnik, flying above the earth, was emitting these cheerful sounds, as if congratulating mankind on a new and magnificent victory over the forces of nature.

The things that began to happen in that enormous hall! You would think the pillars that held it up would collapse from the explosion of ovations and the shouts of congratulations. The dignity of the conference was disrupted as people embraced one another and rushed to the tables where the members of the Soviet delegation were sitting. They shook our hands, kissed us, and thanked us in all languages, as if it were we -- who had just heard the news and this "beep, beep, beep" for the first time ourselves -- who had made this small miracle with our own hands and given earth another spec-sized moon.

That remarkable day, when the Russian word "sputnik" took on a new meaning and entered the lexicon of all the languages spoken by mankind, is especially clear in my memory now, as two space ships blast off from different parts of the earth and speed upward to the first rendevous in space.

Mankind is successfully exploring space in the region of earth. It has been a long time since people went out at night to look at the sky, searching among the swarms of stars for the small, moving starlit winking across the horizon, flying along a route commanded and determined by people on earth. Everyone has become accustomed to the fact that the newspapers regularly report another new sputnik cast into the sky for various romantic or routine but very essential human purposes, and the crew of the space

laboratory Salyut-4 drops into our homes almost every evening and allows us to watch them at work without getting up from our chairs. Millions of television viewers have become familiar and friendly with the space team during these visits and become accustomed to the jokes of Sevast'yanov and the pleasant smiles of Klimuk, coming to us from unimaginable heights.

Nevertheless, now, when the two space ships are approaching one another, again and again I recall that far off day and the little satellite, very small on today's scale, which was first launched by the Soviet people into the realm of outer space.

And another thing. Thinking about the space meeting of the two magnificent flying ships, I recall another significant and also historic meeting -- on the Elbe more than thirty years ago.

The people of the United States and of our country have long had a sympathy for one another. As early as the last century, the glorious Russian thinker Aleksandr Gertsen and the great American poet Walt Whitman spoke of the mutual sympathies of the giant nations, separated, as Gertsen wrote, by an ocean of salt water, but not by age-old biases and prejudices. And on that long-ago spring day in 1945, a day saturated by the aroma of flowering cherry trees, I was a witness to the rightness of these two glorious thinkers who dreamed of friendship between the Russians and the Americans.

That day I went out to the Elbe to help to prepare for the upcoming meeting of forward units of the two allied powers, whose scouts had already arrived at the river.

In the morning, patrols reported that on the opposite bank several military trucks had appeared, from which soldiers jumped wearing a uniform such as we had never seen, in clothing which looked like our ski suits, wearing helmets covered with camouflage netting. Suddenly the bank came to life and resounded with shouts of greeting. Across the river there were also shouts and the waving of hands. Then the enterprising Americans threw an ancient old long boat onto the water and, rowing with boards, began to cross the spring-swollen Elbe.

The rapid current seized the untrustworthy little boat and carried it down directly toward the girders of a blown-up bridge hanging down into the water. It would have ended in tragedy if it had not been for our soldiers, who rushed along the iron girders right to the place of possible collision and grabbed hold of the boat and triumphantly brought it to shore. All along the river banks there were the sounds of Russian concertinas and songs; the soldiers began a dance which you might think would shake the banks of the German river. Veterans, parting late in the evening, promised not to forget one another, they promised to write and to meet again.

And they did not forget. Several years later in Moscow we received a delegation of veterans of this meeting on the Elbe; we showed them the capital city and gave them a tour of the country. And they paid us back. The delegation of Soviet veterans was invited to the United States. Among others in that delegation was my friend Aleksey Mares'yev, who covered that meeting on the Elbe from the air, and I, who took part in that meeting. And although in those days United States was going through a time that was difficult for such meetings, although the shadow of the raving McCarthy hovered over the land and it was dangerous for Americans to have anything to do with Soviet people, we were greeted heartily.

This manifestation of the mutual sympathies of the two great countries, sympathies spoken of on both sides of the ocean by Gertsen and Whitman, is recalled to me now as the Soyuz and Apollo are flying to meet one another in the boundless reaches of space.

I also recall the meeting of Leonid Il'ich Brezhnev and Gerald Ford in the vicinity of Vladivostok. It was a meeting of the leaders of two great nations living far from one another in different parts of the world, coming to an increasingly firm conviction of the necessity of eliminating war from the life of society, of arranging multilateral, mutually-beneficial cooperation in the interests of strengthening peace on our planet. This meeting, these discussions, and these actions in the name of peaceful co-existence, recorded in mutually formulated documents, represent significant pages in earth's history.

And now the space ships built by the technical genius of the two great nations are so to speak recording by their flight the importance and significance of the hand-shake in Vladivostok, the irreversibility of the positive processes taking place on earth, and confirming that space must be and remain peaceful.

During these exciting hours I, a veteran who once shook hands with the American boys on the Elbe, should like to shout out at the Soyuz and Apollo spaceships:

"Have a good rendezvous, fellows! Firm handshakes, friendly and fruitful work, and a safe return to Mother Earth, who is so proudly following the unprecedented space feat of her brave sons." Boris Polevoy.

Successful Launches. The Flight Mirrored in the World Press.

> The beginning of the joint Soviet-American space experiment is the central theme of the foreign press. The front pages are publishing photographs depicting the moments of launch of the Soyuz and Apollo spaceships, also portraits of the cosmonauts and astronauts; whole pages are devoted to reports concerning the launches at Baykonur and on Cape Canaveral. The newspapers are quoting the words of General Secretary of the CCCPSU

L. I. Brezhnv as he wished the Soviet and American spaceship crews a successful flight.

Sofiya: Exciting Moments

We may say without exaggeration that during the exciting moments of the Soviet and American spaceship launches everyone here hurried to find a place next to television sets and radios. The great day in world cosmonautics found brilliant expression in Bulgaria as well.

Here is what the IZVESTIYA correspondent was told by Nikola Niloloyev, director of the astronautics section of the Bulgarian Academy of Sciences and Sofiya University:

"The joint flight of the Soviet and American cosmonauts is a great and convincing example of the fact that all people, regardless of their social structure, can live peacefully, in an atmosphere of mutual understanding. This enormously important experiment is of great political significance."

Paris: They're Off!

"Successful Launch," "They're Off!", "Space Voyage Underway," -- these are the headlines on the front pages of Paris newspapers publishing bulletins and comments on Soyuz-Apollo space experiment.

In recent days preparation for this flight have occupied a prominent place in the news broadcasts over French radio and television, in the pages of newspapers and magazines. Millions of French people were able to study in detail both the plan of the flight and its participants, also the design of both spaceships. Yesterday, French television brought direct reports concerning the Soyuz-19 launch from the space port at Baykonur and the Saturn rocket carrying the Apollo spaceship on Cape Canaveral.

French scientific commentators are focusing primarily on the historic significance of the Soyuz-Apollo flight as a symbol of cooperation between the earth's nations in exploring outer space.

Analyzing the technical aspects of the joint flight, the newspaper LE MONDE is emphasizing the enormous range of preparatory operations carried out in both countries in order to guarantee the successful docking of the two spaceships.

Stockholm: Symbol of Cooperation

Great interest is being demonstrated here toward the Soviet American space experiment.

Swedish television has shown not only a chronicle of the launch of the two ships and broadcasts from the tracking centers but also pre-recorded reports from the town of Zvezdnyy as well as interviews with cosmonauts

A. Leonov and V. Kubasov.

Commentators are emphasizing that the flight of the Soyuz and Apollo represents a continuation of the expanding cooperation between the Soviet Union and the United States. The newspaper DAGENS NYHETER sees the new space experiment as a great symbolic goal -- a confirmation of the fact that "coldwar" is long a thing of the past.

Mexico City: For the Good of Mankind

The joint Soviet-American experiment in space which began with the launch of the Soyuz and Apollo ships is viewed in Latin-America as an important step on the road to the relaxation of international tensions.

In an editorial dealing with this remarkable event, Mexico's leading newspaper EXCELSIOR writes: "the launch of the spaceships -- the Soviet Soyuz and the American Apollo -- is one more among many pieces of evidence indicating the relaxation in relationship between the Soviet Union and the United States."

Noting that this event also reflects other aspects of cooperation between the Soviet Union and the United States, EXCELSIOR remarks: "the consequences of this bilateral cooperation are perfectly obvious both for science and for the strengthening of peace." In the newspaper's opinion, this experiment has combined the efforts of the two powers, which will enrich our knowledge about space.

Another newspaper in the capital city -- DIA -- emphasizes that in addition to cooperation and space exploration the Soviet Union and the United States are developing relationships in other spheres as well, such as weather forecasting and cultural exchanges. (News items dispatched by IZVESTIYA correspondents).

In Order To Resolve Problems On Earth

SUNDAY TELEGRAPH, London

Imagine a spaceship in orbit which cannot return to earth. Suppose its crew is wounded or is threatened with suffocation as precious oxygen begins to run out. What are the chances of another country sending a ship to provide aid or bring the cosmonauts back to earth? This week we will find out.

During the experiment, which is known as EPAS, the American astronauts were launched from Cape Canaveral in order to seek out the Russian spaceship, to pass into it, and to greet the Soviet cosmonauts in their native language.

This flight is an exciting prelude to the day when the astronauts of many nations will get together to work aboard large orbital stations.

Russian and American scientists are already talking about a new industrial revolution, when materials that are unique of their kind will be produced under conditions of weightlessness in factories out in space. Others are seriously talking about victory over the fuel (energy) crisis by trapping the sun's rays out in space and directing them to earth.

A large number of experiments which the cosmonauts are carrying out will be all of extremely practical importance.

What consequences will follow the Apollo-Soyuz project? At the very least, one factor -- lower costs in joint flights -- will obviously guarantee a continuation of this cooperation. In November, leading scientists of the two powers will again get together in order to discuss further joint operations.

By 1980 flights to outer space and back will cost much less thanks to a transport space shuttle which will lift off vertically like a rocket and land back on earth like an airplane. In addition, American designers have decided to convert to a spaceship atmosphere which is the same as the Russian system, so that their ships can dock without complications.

Thus, in the 1980's, under conditions of political stability on earth, space crews from the East and the West will be able to work on each other's orbiting platforms to develop new technological processes.

NEW YORK TIMES

One of the broadest joint technological programs ever undertaken by two countries has prepared the way for docking in space between the Apollo and Soyuz. For several years, dozens of Soviet and American space engineers, trained under different technological, political, and linguistic conditions, have had to learn how to work together, step by step, on hundreds of different problems that had to be solved before Soviet and American cosmonauts rendevous at an altitude of more than one hundred miles above earth.

Although the meeting of the Soviet and American ships will take place in space, its true significance is to be seen here on earth, as the result of five years of negotiations, diplomatic and technological efforts which led to this mission. The Soyuz-Apollo project is in the final analysis the product of the relaxation of tensions and simultaneously a turning point in space exploration.

A random coincidence is the fact that today's launches of Apollo and Soyuz took place just one day before the thirtieth anniversary of the first nuclear explosion on our planet. This coincidence emphasizes

the dilemma confronting mankind: nuclear destruction or close cooperation with, for example, was necessary in order to make possible the Soviet-American space mission. This is an important and encouraging indication that man's exploration of outer space, which began "coldwar" at the present moment has been transformed into an attempt to achieve a friendly meeting in space.

TRYBUNA LUDU, Warsaw

An astonishing combination of romanticism and the most advanced technology! But it could not be any other way, because this is a matter of an event of enormous importance; and what is most important, it is qualitatively different from any previous events -- above all in the political sense.

This event took place on 15 July, when the Soviet spaceship Soyuz was launched from the space port at Baykonur, and seven and one-half hours later the American spaceship Apollo was launched from Cape Canaveral in Florida. Russians and Americans are finding out how to co-exist and work together in space.

Preparations for the historic flight demonstrated that there are reasons for this kind of co-existence, and they are sound ones. The American astronauts visited the Soviet Union several times, and the Soviet cosmonauts visited the United States, where they underwent intensive training. The American astronauts felt right at home in the Soviet space center, and the Soviet cosmonauts felt the same way in America.

During these preparations something developed which is of enormous importance not only for joint flights but also for the shaping of international relations on earth. It is a process of the formation of friendship and trust.

At a press conference, Thomas Stafford said: "During the training we lived together like brothers." And the Soyuz commander Colonel Aleksey Leonov said: "During the eighteen weeks we spent together we resolved many technical problems and mastered all the smallest subtleties of the program; but the most important thing is that we managed to achieve full agreement so that today we trust each other completely."

Was this helped along by the use of Russton -- the common Russian English language whose name derives from a combination of the word Russian and the word Houston? No doubt this is so! But it's not just a matter of language.

This flight has become an indication of the profound changes in Soviet-American relations. Because even an agreement on the subject would be impossible unless a break through had not been achieved in these relations along lines of relaxation and cooperation.

In space, the realization that the Soviet cosmonauts and the American astronauts are able to count on each other strengthens ties between them. This was eloquently described by the director of the Soviet cosmonaut's training General V. Shatalov, when he said: "People on earth do not find it easy to imagine what the joining of two spaceships involve. ... Despite his training, a man begins to feel somewhat out of his element, knowing that both he and his ship constitute a small mote of dust which must find another such small spec of dust and link up to it in the boundless reaches of outer space."

This mutual trust, which was so necessary during training for the flight and which is even more essential than the flight itself, is also having an effect on improving the political climate in the world. With their own eyes people can see examples of the fact that even in problems as difficult as the exploration of space both great countries can demonstrate a high level of trust. Surely this can be extended to other spheres.

We bring to the reader's attention a conversation between Donald Slayton and Valeriy Kubasov, participants in the Soyuz-Apollo flight. Slayton says: "Thirty years ago we were together victorious over Facisim; today we have gotten together to conquer space, and I believe that this flight marks the beginning of our peaceful space cooperation." But Kubasov added to that "We want to cooperate not only in space -- in general our people want to know each other better. After all, cooperation is friendship, and friendship between peoples is peace." NASA Director Dr. James Fletcher said: "I would compare the Soyuz-Apollo project with a climb to the top of a mountain from which we see before us new horizons of Soviet-American scientific-technical cooperation."

This climb is coming to an end. And the horizons are not just those of scientific-technical cooperation but also cooperation in general, in the broadest sense of that word.

Chronicle of the Day. Reports from the KOMSOMOL'SKAYA PRAVDA EPAS Press Center

BAYKONUR

Preparations for the launch are going normally, right on schedule.

The cosmonauts have undergone routine medical examination -- the physicians have no adverse comments.

Operations at the launch area have not stopped for a second.

Aleksey Leonov and Valeriy Kubasov have slept well, as if this were an ordinary night.

Florida

As yet, the Soviet cosmonauts and American astronauts are operating on "local time." Aleksey Leonov and Valeriy Kubasov have been resting, while a special airplane from Houston has landed at the airport on Cape Canaveral. The Apollo crew consisting of T. Stafford, V. Brand, and D. Slayton along with their backup crew have arrived at the space port.

At the airport, one of the American journalists asked Eugene Cernan, who accompanied the Apollo crew, the following question:

"Don't you think that the Soyuz-Apollo flight is considerably simpler than other flights into space already accomplished by Soviet and American cosmonauts?"

Eugene Cernan answered:

"The expression 'simplified flights' does not apply to such an ambitious project as invading space. Every launch is a risk, although the technical level of equipment for today's flights have been considerably improved compared to the first flights. These people who will be in space tomorrow can only be called 'heroic'."

A Telegram

I would call the docking in space one of the most rational, promising manifestations of modern mankind. I wish nothing but success.
V. Tikhonov, engineer. Rostov-na-Donu.

Baykonur

At the space port, journalists met with Aleksey Leonov and Valeriy Kubasov. Their press conference was also attended by the backup crews consisting of A. Filipchenko, N. Rukavishnikov, Y. Romanko, and A. Ivanchenko.

All of the cosmonauts answered questions put by the journalists concerning preparations for the flight. A. Leonov and V. Kubasov were the first to speak.

Cape Canaveral

The countdown has begun on the launch area. The Apollo launch is forty-two hours and thirty minutes away.

The ship's crew, Thomas Stafford, Vance Brand and Donald Slayton are continuing intensive preparation for the flight. T. Stafford telephoned Baykonur and talked with the Soyuz crew concerning progress in preparations for tomorrow.

A press conference was held at the American space port. NASA EPAS program Director Chester Lee announced:

"We have made a thorough and detailed examination of all aspects of the upcoming space flight and determined the readiness of our side to carry out the experimental flight of the Soyuz and Apollo ships."

258-13-39

Dozens of people have been calling the information desk of our press center. Most of the people have asked that we convey their good wishes to the Soyuz and Apollo crews. We will attempt to carry out their request via our special correspondents, also during the on board press conference on 18 July, preparations for which our being participated in by a representative of our press center.

Comrades Samoylov, Anokhin, Vasil'yev ask: "Why are two Soyuz ships being prepared for launch, while the Apollo does not have a backup ship?"

Our Soyuz is being launched first. The Apollo will be on the launch pad for seven more hours. Moreover, during that time crucial operations will be taking place. The launch might be delayed because of malfunctions, and this would pose a threat to the implementation of the joint experiment. If the Apollo is not able to go into orbit at the scheduled time and the delay lasts more than two days, then the first Soyuz will return to earth and our second ship will take its place in space.

Scientists and specialists have tried to foresee all variance, and for this reason the EPAS program calls for a second Soyuz to prepare for flight.

A Telegram

To Aleksey Leonov and Valeriy Kubasov. We are excitedly awaiting the historic meeting in space. Please shake the hands of Thomas Stafford, Donald Slayton, and Vance Brand in our name. Members of the Druzhba Narodov Labor Association of Senior Students. Moscow -- Rostov.

California

The ships have not yet been launched, yet the search and rescue services have long been waiting for the Soyuz and Apollo crews at the landing sites.

A brief bulletin from California:

The helicopter carrier "New Orleans" has left the port of San Diego. It has headed to the Hawaiian archipelgo, where it will take the Apollo carrying the American astronauts on board.

258-13-39

A reader of ours, I. Simonov from Moscow, asks who the main designer of the Soyuz is.

The Soyuz was developed a long time ago; it has been in space many times. A modified ship is being used for the EPAS. The technical director of the project on the Soviet side is corresponding member of the Academy of Sciences USSR K. D. Bushuyev.

The Soyuz, like the legendary Vostok Voskhod, which carried into space Yuriy Gagarin and the first Soviet cosmonauts, including the present Soyuz commander Aleksey Leonov was developed under the guidance of the eminent Soviet designer academician Sergey Pavlovich Korolev.

Surprise

As everyone knows, it is impolite to go visiting without taking something. Especially in a new home. The rules of space etiquette have not yet been worked out, but there can be no doubt that the best traditions on earth will not be ignored in space either. In any case, the members of the Soyuz and Apollo crews will walk up -- or, more accurately, will glide up -- to begin their visit carrying gifts.

First of all the Soviet and American cosmonauts will exchange national flags. As souvenirs. In addition, they will exchange the halves of commemorative medals. In addition, seeds from a pine tree. Kubasov and Leonov will present their friends with seeds from the Russian pine tree, and in response they will get seeds from an American pine tree. On earth, these seeds will be planted on the two different continents.

Let us trust that these seeds will yield sturdy growth.

Flight Control Center

On 14 July at fifteen hours twenty minutes, exactly one day before the Soyuz launch, the shift supervisor at the Soviet center Vadim Kravets got in direct touch with Houston and reported to his American colleague John Temple that 24-hour readiness had been declared in the Soviet center.

The count has now begun in minutes. Just a few more hours, and the count will be in seconds: 3 ... 2 ... 1 ...!

The Telegram

Dear Aleksey Arkhipovich and Valeriy Nilolayevich: Tomorrow, our country is sending you to carry out a very important assignment. We wish you great success, a good journey, and a safe return to earth. We are proud to see you off, Aleksey Akhipovich, an honorary member of our team. We believe in continuing our friendship. We will be waiting for you! Convey our greetings to the American cosmonauts. High School No. 45. Khar'kov.

Soyuz

We did not get a chance to explain what excellent cooks Valeriy Kubasov and Aleksey Leonov have proved to be at home (the cosmonauts themselves are silent about this), but in space, on board the Soyuz, they will have to prove themselves in that capacity.

It is true that the Russian cabbage soup and the Ukranian borsch, to be honest about it, were prepared beforehand, on earth, and they were prepared by excellent masters of their craft, and all the cosmonauts will have to do is eat the food. But you must agree that space is not like earth. It takes some skill to warm food there as well.

Incidentally, the same (problem) confronts the American cosmonauts too: they have prepared some of their famous American beef steaks for their Soviet colleagues.

Moscow

Yesterday a press conference was held for journalists accredited to the Soviet press center.

Academician B. N. Petrov: "the upcoming flight marks a new stage in the development of cosmonautics. Already before the flight we can see the fruits of cooperation. The words "docking" itself has now become a symbol, a synonym of cooperation. This is an example which we can follow to resolve many international problems."

A. S. Yeliseyev: "the main difficulty which has faced the American and Soviet specialists is that of simultaneously controlling the flight from two centers. Neither we nor the Americans ever had such an experience."

Bonn

A telephone call from Bonn. At the other end of the line is our own correspondent to West Germany Genrikh Gurkov:

"In West Germany this is the time of summer vacations. The highways are packed with different colored cars. The owners of motels and

restaurants located along the highway have responded rapidly to the demand of "space fans," installing television sets in all rooms. Experts predict that broadcasts about the rendevous in outer space will break all records in terms of number of viewers."

An Interview

Our correspondent Nikolay Orekhov: accredited to the press center, reports by telephone:

A press conference just ended. At the end there were many questions. Here are a few of them:

MAYAK PROGRAM: Why was 15 July selected as the launch date?

Answer: The day was selected arbitrarily. But the exact time of the launch of the Soyuz and the Apollo was determined after complicated calculations which took account of many objective factors, as well as the wishes of both sides. As a result, the Soyuz is to be launched at 15 hours 20 minutes, with 10 minutes to spare. The next "interval" will be about one day later.

LOS ANGELES TIMES: Which of the stages of the flight are most complicated and dangerous?

Answer: Launch and landing.

FRANCE PRESSE: Will the crews of the Soyuz-Apollo ships and the crew of the Salyut Soviet space station be able to see one another?

Answer: The minimum possible distance between the ships is determined by the difference in their average flight altitude -- 125 kilometers. Once every two days the Salyut will fly above the Solyuz and Apollo. At those moments the cosmonauts will be able to establish direct communication by radio and, if the lighting is right, they will be able to see the other space ship.

> And so, they are to be launched today. First the launch, followed by waiting and then the strain of G-forces until the ship reaches orbit. After that the work begins. But today ... today -- is the final hours on earth. (These reports from the COMSONO PRAVDA PRESS CENTER were submitted by V. Gubarev and L. Repin).

16 July 1975. A Day of Maneveurs. TASS Bulletin.

Moscow Flight Control Center, 16 July. (TASS) The second working day for Aleksey Leonov and Valeriy Kubasov began today at nine o'clock.

After their sleep, the cosmonauts continued to check out the condition of the on-board systems of the Soyuz-19.

While the crew was sleeping, the spaceship Soyuz-19 was outside the zones of radio visibility of the tracking stations located on the territory of the Soviet Union. During that time control of the on-board systems was provided by means of scientific-research ships of the Academy of Sciences USSR "Kosmonavt Yuriy Gagarin" and "Akademik Sergey Korolev," located respectively near the eastern coast of Canada and in the Gulf of Honduras in the Caribbean Sea.

After getting dressed and shaving, the cosmonauts had breakfast and set about carrying out the second day's flight program. Because they were not able to make television broadcasts from the ship during the first working day, during later communication sessions the Moscow flight control center transmitted recommendations to the ship with respect to insuring the functioning of the television system.

Normal temperature and pressure are being maintained in the compartments of the Soyuz-19. Cosmonauts Aleksey Leonov and Valeriy Kubasov feel fine. The flight continues.

Houston, Flight Control Center, 16 July. (Special TASS Correspondent) The crew of the Apollo has completed its first working day in space. The American cosmonauts have now begun an 8-hour period of rest. According to a bulletin from the flight control center, they feel fine.

After entering orbit, the Apollo separated from the last stage of the carrier rocket, made a 180-degree turn, connected to the docking module, and extracted it from the cross-piece which joined the ship to the final stage of the carrier rocket. In order to avoid colliding with the final stage it executed a withdrawl maneveur.

It was announced that the crew was unable to dismantle the hatch providing passage into the docking module during the specified time. Later on the flight control center reported that the crew of the Apollo spaceship had managed to eliminate the malfunction in the docking device of the command module, the malfunction which had prevented entry into the tunnel of the docking module.

Moscow Flight Control Center, 16 July. (TASS). At 20 hours 40 minutes Moscow time the space ship Soyuz-19 completed twenty orbits around the earth. After a corrective move carried out on the seventeenth orbit, the ship entered link-up orbit with the following parameters:

-- maximum distance from earth's surface 225.4 kilometers;

-- minimum distance from earth's surface 222.7 kilometers;

-- orbiting period 88.9 minutes;

-- orbital inclination 51.8 degrees.

Thus, the crew of the Soyuz-19 executed the basic operations scheduled by the program of the joint flight, operations guaranteeing the necessary conditions for the docking with the Apollo.

During the nineteenth orbit Aleksey Leonov and Valeriy Kubasov continued to work on restoring the functioning of the on-board television equipment. Although the technological repair operations carried out by the Soyuz-19 crew were fairly worked out before hand by specialists and cosmonauts on the replica of the ship on earth.

Repairs to the television system were executed in accordance with recommendations by specialists at the Soviet flight control center and was successfully carried out under complex conditions of space flight. On the next orbit, the twentieth, the cosmonauts Aleksey Leonov and Valeriy Kubasov made the first television report from on board the spaceship Soyuz-19; it was transmitted by Central Television. The quality of the color broadcast was excellent.

Cosmonauts Aleksey Leonov and Valeriy Kubasov are in an excellent mood and feel fine. The flight of Soyuz-19 continues.

In Waiting Orbit

Special IZVESTYA Correspondent Boris Konovalov Reports From the Soviet Flight Control Center

On the large world map of the main room of the Moscow Flight Control Center you can clearly see the two lighted trajectories of movement of the space ships Soyuz and Apollo, lines which resembled sinusoids. From orbit to orbit they intersect various earth stations which maintain communications with the crews. Communications are maintained with the Apollo by stations located not only in the United States but also in Spain and other parts of the globe. All seven Soviet tracking stations are located only on the territory of our country: Yevpatoriya, Ulan-Ude, Ussuriysk, Dzhusaly, Petropavlovsk-Kamchatskiy, Kolpashevo, Tbilisi. In addition, communications with the spaceships are maintained by ocean-going ships. Near the east coast of Canada, in the Atlantic Ocean, the Kosmonavt "Yuriy Gagarin" is on duty. Akademik "Sergey Korolev" is on duty in the Gulf of Honduras in the Caribbean Sea. And the American tracking ship "Vangaard" is in the Pacific Ocean.

This is an equally busy time for earth and for the crew. In the control centers, large high-speed computers are processing trajectory measurement data that comes in from all tracking stations in order to issue recommendations to the crews on carrying out maneveurs to form the link-up orbit, where the docking will take place.

Soyuz-19 went into orbit superbly. It ended up very close to the calculated orbit. During the first orbits the ship moved along an ellipse with a distance of 186 kilometers in the perigee and 221

kilometers in the apogee. The figuring of the distances, in accordance with agreement by the two sides, is made above a standardized sphere whose radius is the average radius of our planet at the equator. The Apollo was launched in the orbital plane of the Soyuz, and at the moment it entered space the ships were separated by approximately 6,000 kilometers. Soyuz was in front. The Apollo is moving along a lower orbit at a greater speed than the Soyuz, gradually catching up with it.

On the fourth orbit, A. Leonov and V. Kubasov carried out the first maneveur to form the orbit. At a point figured so as to go into circular orbit with a radius of 225 kilometers, with a minumum consumption of fuel, engines were turned on to make the first correction. Soyuz went into an ellipse of movement with a perigee of 192 kilometers and an apogee of 228 kilometers. On the seventeenth orbit on 16 July the Soyuz made a second maneuver for the final formation of the link-up orbit.

The Apollo crew also carried out the first maneuver designed to achieve a specific speed for approaching the Soyuz. Today the astronauts will carry out a number of other maneuvers. Finally the ships, at a strictly designated time, are to arrive at particular points in the link-up orbit at a distance of abour 500 kilometers from one another. The Apollo should be 18 kilometers below Soyuz.

The busy time of "maneuvers in space" does not hinder the scientific investigations. On 15 July Aleksey Leonov and Valeriy Kubasov began biological experiments. These experiments had already been carried out on the Soyuz-16 flight. Now it will be interesting to compare the results. The purpose of these experiments is to determine how the conditions of space flight -- weightlessness, streams of radiation, and changes in the intensity of the earth's magnetic field -- effect the growth, development, and heredity of different biological cultures. The objects of investigation of micro-organisms, different kinds of of seeds, and the small fry of the well known aquarium fish Danio Rerio.

One distinctive feature of this flight is that some scientific experiments will be carried out in parallel on the Soviet and American ships. For example, an experiment with the so called zone-forming fungi. During their growth they form rings that are similar to the yearly rings of trees. Every twelve hours the cosmonauts and astronauts will photograph the instrument in which the fungi are growing in a nutrient. This experiment, begun on different continents, will for two days proceed on the linked-up ships under identical conditions, and will again be concluded on different continents. The experiment makes it possible to verify how "biological clocks" operate. The rings of the fungi grow with a certain cyclicity, and it is important for the scientists to compare how they will change, whether they will change identically on the two ships. In addition, the same instrument

has a special counter to record heavy cosmic particles and it is possible to observe how their "visits" affect living matter.

Space flights rarely take place without "surprises." On the Soyuz there has been a malfunction in the on-board television system. The crew, making use of advise from earth, has been taking the necessary steps to correct the situation. Repairs are scheduled to be completed at 10 o'clock at night on 16 July. Aboard the Apollo the crew found a malfunction in the docking module. One of the hatches in the passage lock was not opening. There were other unexpected developments. As a result, the American astronauts, like ours, went to bed 1.5 hours late. The American Control Center hopes that the astronauts will be able to correct the malfunctions.

On 16 July A. Leonov and V. Kubasov woke up earlier than scheduled. They energetically set about their work. Communication sessions proceeded in a compact and precise rhythm.

"Soyuz, this is Moscow. We have a lot of information for you," the Control Center reported frequently.

"Well then let's not waste any time," came the answer from A. Leonov. "Go ahead."

On the evening of 16 July in the main room of the Flight Control Center, friendly applause broke out. On the screen, showed the happy, smiling faces of Aleksey Leonov and Valeriy Kubasov. Repairs to the on-board television system were completed on the twentieth orbit of Soyuz-19.

On the day of the launch, when it became clear that the television sets had "gone blank" and no signal was coming from ship, specialists utilized a replica of the Soyuz ship on earth to make a thorough analysis of the situation and locate the trouble spot. It turned out to be a switchboard unit which was suppose to function as a "dispatcher," connecting any particular television camera to the on-board transmitter. It was decided to remove this trouble spot, so to speak,surgically: to to hook-up the color television cameras directly to the transmitter.

Then it was time for the cosmonauts remaining behind on earth to get to work. The commander of the support crew Vladimir Dzhanibekov in the replica of Soyuz carried out the entire repair process, and recommendations were transmitted to the spaceship. A. Loenov and V. Kubasov completed the repairs in three moves. On the evening of 15 July they uncovered a decorative panel in the orbital compartment, behind which the switch-board unit was concealed. On the morning of 16 July they began to disconnect the junctions and changed the radio circuits. By evening they had brilliantly completed the work.

We were told by Vladimir Dzhanibekov, who did the work on earth, that these were rather laborious operations requiring skill in the use of tools and an intelligent utilization of means and materials handily available on board. Instead of insulating tape, for example, they made use of medical adhesive tape. Once again A. Leonov and V. Kubasov proved that a cosmonaut had to be a master of all trades.

On the next orbit, the twenty-first, the Soyuz-19 crew awaited a joyful event. Aleksey Leonov and Valeriy Kubasov were able to speak with the crew of the Salyut-4, Petr Klimuk and Vitaliy Sevast'yanov, who had already been working in space almost two months. The Salyut-4 was flying higher than the Soyuz and in front of it, so that the Yevpatoriya and Dzhusaly tracking stations were able to carry on lengthy radio contact.

"Congratulations on achieving orbit," said the crew of the Salyut-4.

Leonov answered: "Thanks, and greetings to you old timers in space. Petr, recently I saw your son Mishka; he asked me to convey to you a huge greeting in space."

"Thanks," said Klimuk. "We are watching you all the time; sometimes we can hear your radio conversations with the Center, but we have not butted in because we don't want to interfere. Your work is crucial."

The cosmonauts chat, interrupting one another. The joy of greeting in outerspace can be clearly sensed here on earth. As usual, Leonov is joking.

"If you need anything repaired," says he to Klimuk and Sevast'yanov, "we're ready!"

Celestial Mechanics

Special IZVESTIYA Correspondent Bronislav Koltovoy reports from Houston

In front of the headquarters of the Johnson Space Center there is a flag pole. Under the United States flag flies a banner with the emblem of EPAS Program. This emblem can be seen everywhere these days: on pins and on T shirts, on stamps and on envelopes, on all kinds of souvenirs that are so vigorously being hawked by local shop owners, on the pages of newspapers and television screens. Truly, today in America the joint flight of the two ships is topic of conversation number one. For this reason, a magnet for newspapermen now is the Flight Control Center, which is located right here, at the Johnson Space Center. All news comes from right here.

This windowless three-story building receives all information coming from space to the tracking stations located all over the globe. Twenty-four hours a day, hundreds of scientists, engineers, and technicans

are on duty in the main room and in numerous rooms throughout the center. They are alertly keeping track of the endless flow of telemetric information from on board the Apollo and talking with the crew.

In the main hall of the Control Center the entire front wall is taken up by a huge illuminated board. Right in the center is a map of the two hemispheres of the planet. Illuminated lines wide around it. These are projections of the orbits of the Soyuz and the Apollo on the flatness of the map. Along the curves, bright spots move deceptively slowly: the Soyuz in front, the Apollo behind. During the evening, at 19 hours 15 minutes Moscow time, they are scheduled to merge together.

Here is located the flight control operations post, all is ready to come to the aid of the astronauts if the necessity arises. It did arise during the very first days of the Apollo flight. Vance Brand informed earth that he could not open the hatch to enter the docking compartment, because he was not able to remove the pin by which the orbital connection of the main Apollo module with the docking module was accomplished. The situation was serious: they would be able to connect the two ships, because the malfunction had nothing to do with the main docking assembly, but passage from one ship to another would be impossible.

The astronauts fiddled for some time with the stubborn pin, but finally, on orders from the Flight Director, went to bed without having achieved success. Then, feverishly busy hours began in the Center. They urgently gathered together personnel who were specialists in the system which included the troublesome pin. On a mark-up of the entire assembly they checked all the possible causes of the malfunction and rapidly made a diagnosis.

In the morning the mark-up was brought directly into the main room and placed next to the operator who was transmitting to the astronauts. Right during the conversation with the ship, the systems specialist showed the operator which lid to remove, which nuts to unscrew in order to get to the root of the problem. One-half hour after the consultation, the pin which had caused the first agitation to the crew of the Apollo, was finally removed. From space came the words: "Okay! The way to the docking module is clear."

By the way, this is the second time that the stubborn pin has flown in space. The first time such a thing happened was on Apollo-14. The pin acted up then also. After that flight, the pin was carefully studied and redesigned. But as it turns out, it has retained its former character.

The tension of the emergency work is best relieved by joking. After the emergency was over, on the screens of the monitors in the control room instead of columns of dry figures, there unexpectedly appeared a

cartoon drawing: three astronauts in cowboy suits and wearing hats tilted to one side were riding the Apollo and looking into deep space. Under the drawing was the caption: "Where are they?" This cartoon was given in Moscow by Aleksey Leonov, before the flight to the space park, to our specialists who were scheduled to work at the Houston Center. The affectionate joke by the commander of the Soyuz turned out to be especially appropriate on that difficult day.

As the saying goes, there is no evil withou some good. The episode with the pin demonstrated that the collective of the Houston Control Center was working confidently, precisely, was able to make the only correct decision rapidly. Undoubtedly, the extensive preparations carried out by both control centers helped the situation, the joint training of the Soviet and American specialists now sitting at the control panels. During meetings they had run through a great number of all kinds of unexpected situations in which it would be necessary to find solutions to difficult problems in just a few minutes. The technical director of the project on the Soviet side, corresponding member of the Academy of Sciences USSR K. Bushuyev said then, comforting the tired control workers: "Difficult in training, easy in battle." Today, I believe, the on-duty shift who solved the pin problem recalled these words.

The Apollo flight is proceeding normally. According to reports from space, the astronauts feel fine. They have not lost their humor. The Apollo Commander Thomas Stafford, speaking in a completely serious manner, informed Houston that he had caught a stowaway on board: Then, laughing, he explained that before the launch a Florida mosquito had flown into the ship and was now accompanying them on the orbital flight. Donald Slayton, also keeping his earthly habits, vigorously engages in physical exercises during his leisure time. The crew is observing the earth's surface and carrying out a number of experiments, also preparing for the maneuver to go into link-up orbit, where the Soyuz is waiting for them. By the way, here in the Control Center they highly appreciate the excellence of the work of the crew of the Soviet spaceship. The maneuver designed to go into link-up orbit by the Soyuz, according to Houston's evaluations, was executed nearly flawlessly exactly as the ballistics people commanded.

Today the crews of both ships have a difficult day. Let us hope that it will be successful. After all, the whole world is waiting for the two countries to shake hands in space.

The Flow of Space Information

Report from the Moscow Press Center

Journalists often speak proudly of cosmonauts as being their colleagues. Practically everyone of them can handle photograph and motion picture

cameras superbly and knows how to conduct a lively report. Many of our "space reporters" are authors of attractive and profound books.

But there is a difference between the reporters on earth and their "colleagues" in space, and it is a big one. This was convincingly shown yesterday. In the Moscow Flight Press Center, and consequently at Houston as well, it became known that on the first working day the crew of the Soyuz-19 was unsuccessful in making television broadcasts from the ship. And then, from the Americans came an unexpected bulletin as well. The astronauts on board the Apollo were not able to open one of the hatches permitting passage to the docking module on time.

One can easily understand how disturbed the journalists were. Consultants temporarily headquartered on the third floor of the Moscow Hotel Interist had to work hard to answer the numerous questions of the demanding correspondents. The journalists were informed about the situation in the Press Center by day, and then once more at night. Report dealt with the efforts of the cosmonauts to correct the malfunctions which, alas, are not excluded even in extremely vital matters.

When V. G. Kravets, the shift flight director on the Soviet side, appeared at 6 o'clock in the evening behind a desk with numerous microphones in front of the Soviety Soyuz and the American Apollo emblems, the large room became silent. Only in the earphones connected to the radio relay from the Moscow Flight Control Center did conversation continue. We were able to follow it. Earth was calmly and precisely giving recommendations on what to do in order to correct the malfunctions in the television communications. The men in space, in turn, answered calmly, briefly, and confidently.

V. G. Kravets told the journalists that although the crew of the Soyuz-19 had been authorized a longer because of the fact that they had worked overtime the day before, A. Leonov and V. Kubasov got up 1.5 hours earlier then scheduled (or in space terms 1 orbit earlier). They could not do otherwise: they wanted to have plenty of time available for unscheduled work. By 18:00 hours they managed to complete two of the three steps recommended by earth to correct the malfunction in the television system. In addition, they carried out everything that the scheduled program called for.

The shift flight director expressed a hope that by evening the Soviet cosmonauts and their American partners would be able to complete the repair work. V. G. Kravets did not leave the journalists the slightest doubt of success.

Yes, our "colleagues" proved to be "on top" of the situation and showed that they are truly masters of all trades. And how grateful earth was to them for that could be sensed on the evening of 16 July during the first television broadcast from the Soyuz-19, when the colleague of V. G. Kravets, the current shift director, said warmly: "Thanks -- you are great guys, Aleksey."

The Americans also proved themselves great guys in handling their hatch problem. And so, everything is leading up to today's docking of the two ships. This is also being announced from Houston, with which constant communications are maintained by American NASA representatives who have an office at the Moscow Press Center.

One of the latest telegrams coming into the Press Center. Samarkand city executive committee has elected as honorary citizens of that city A. Leonov, V. Kubasov, T. Stafford, V. Brand, and D. Slayton. These stars of space are now becoming countrymen of the great astronomer Ulugbek. A. Krivoplov.

Kavkazy, Come In!

Special IZVESTYA Correspondent Andrey Ivakhnov Reports from the Salyut-4 Flight Control Center

We watched the Soyuz-19 launch on television in the room of the group conducting radio contact with the crew. Just before we arrived they had played the previous day's first communication with Kovkozy. The voice of the crew's commander was recorded on tape:

"We are awaiting our friends in orbit!

On a desk we saw a sheet of drawing paper with portraits of A. Leonov and V. Kubasov attached to it, also little pages of greetings in verse: a local artist was preparing a humorous poster.

...On the television screen we could see the rocket speeding into the sky. Puffs of smoke surrounded the service girders which only recently had held the body of the ship... Solyuz-19 was in space! A tall young man in a bright yellow shirt again sat down to the drawing paper and finished the caption. The poster would hang next to two others: "Kovkozy in orbit!" and "The crew on board the Salyut-4!"

There was a signal, and our artist stood up from the desk and headed into the cabin with the word Zarya on the door. We could hear his voice -- this time through the loudspeakers:

"Kovkozy, come in ..."

The conversation had hardly begun before P. Klimuk and V. Sevast'yanov literally interrupted one another to ask how the lunch had gone.

One of the shift flight directors told us that the orbits of the scientific station and the Soyuz-19 were placed at a certain angle to each other, and the two ships could approach one another only at two so-called "orbital conjunction point."

Late that night the Apollo was launched from Cape Canaveral. Now, all three manned spaceships seven brave men -- four Soviet cosmonauts and three American astronauts -- were located in earth's orbit. P. Klimuk and V. Sevast'yanov asked our center to convey their congratulations to the participants in the experimental international flight.

The Flight in the Mirror of the World Press

A Historic Experiment

It was with a feeling of great satisfaction and joy that the world greeted the successful beginning of the joint Soviet-American experiment in space. In the commentaries of the foreign press and the statements of scientists and public figures it has been emphasized that this experiment is of great scientific and political importance and constitutes a direct consequence of the policy of relaxation of tensions.

NEW YORK TIMES writes: "The Soyuz and Apollo flight represents an enormous stride in the way to cooperation between the two great nations." CHRISTIAN SCIENCE MONITOR emphasizes: "The Soviet-American space experiment demonstrates that world-powers can cooperate in different spheres."

"There can be no doubt that the joint flight and the upcoming docking in space of the Soviet and American ships mark an event of extraordinary importance, representing a new stage on the road to development of cooperation between the United States and the Soviet Union," declared L. Weicker, a member of the Senate Committee on Aeronautics and Space Exploration. He emphasized "I believe that the overall development of business ties between the United States and the Soviet Union plays an especially vital role in the fate of the world, because it helps to strengthen international relaxation for the sake of all nations." The Senator continued: "I am glad that the governments of the Soviet Union and the United States are seeking and finding new spheres of cooperation, an example of which is the historic flight of the Soyuz and the Apollo. Acting together we can achieve more than by acting singly."

The Bulgarian newspaper NARODNA ARMIYA points out: "without diminishing the importance of this flight for the future development of space technology, it is essential to say that the political importance of the Soviet-American space experiment is enormous, because it will help to improve mutual understanding between the Soviet Union and the United States, and to raise Soviet-American cooperation to a new and higher orbit."

The director of the Electronics Institute of the Academy of Sciences G.D.R. Hans-Joachim Fiascher has declared: "The joint Soviety-American space experiment will make an important contribution toward the relaxation of international tensions, the struggle for which is the constant concern of the countries of the Socialist Commonwealth headed by the Soviet Union. The very fact of the flight, participated in by two countries having different social structures, testifies to the fact that the idea of relaxation has become firmly entrenched in people's minds. The results of the flight will benefit all mankind."

Poland's Minister of Foreign Affairs S. Olszowski, in an interview with a TASS corresponden , said: "It is with excitement and eagerness that we are watching the important experiment -- the joint flight of the Soviet ship Soyuz and the American Apollo. The prerequisites for such an outstanding event in space were created on earth, and are closely linked with mankind's concerns today. It has become possible not only thanks to the labor of outstanding scientists, talented designers, and brave cosmonauts, but also -- and this must be especially emphasized -- the policy of the relaxation of tensions and international cooperation, the groundwork for which was laid and is being consistently implemented by the Communist Party of the Soviet Union and the Soviet Government."

The Mongolian newspaper Unen describes the joint experiment this way: "A new and bright expression of the consistent efforts of the Soviet Union to utilize the achievements of science and technology for the good of the world and mutual cooperation."

The French newspaper L'Humanite writes: "The joint flight of the American and Soviet ships is the result of the policy of peaceful co-existence, a symbol of relaxation, without which cooperation in the field of space exploration would be inconceivable."

The Italian newspaper Paese Sera remarks: "Everyone understands that the launch of the Soviet and American spaceships is something greater than a simple space experiment. It testifies to the fact that the international situation has changed and is developing along lines of cooperation in all fields." (TASS).

Chronicle of the Day. Reports from the KOMSOMOL'SKAYA PRAVDA EPAS Press Center

Flight Control Center

TASS reports:

The second working day of Aleksey Leonov and Valeriy Kubasov began on 16 July at 9 o'clock. After getting up, the cosmonauts continued to check out the condition of the on-board systems of the Soyuz-19.

Kemerovo

A phone call from Kemerovo. On the telephone is the correspondent from the newspaper KOMSOMOLETS KUZDASSA Yevgeniy Krasnosel'skiy:

"Yesterday was a happy day for the inhabitants of the little village of Listvyanka (Tisul'skiy Rayon): Once more their countryman Aleksey Leonov is in space. In honor the new space experiment, party Members and komsomol members of the village have organized a competition under the slogan, "Work Like Leonov Does." Young local truck drivers Nikolay Borisov, Sergey Bondarev, Nikolay Zagumennykh, and Vladimir Il'yenko are constantly overfulfilling their shift assignments. Viktor Tkachenko, secretary of the Komsomol Committee of the kolkhoz, says:

"We want to say this to our countrymen: Carry out your mission in space, and we promise to carry out our mission here on earth."

The Press

The joint Soviet-American space experiment is the main subject being discussed in the foreign press. The front pages are printing photographs depicting the launches of the spaceships Soyuz and Apollo, also portraits of the cosmonatus and astronauts; entire pages are devoted to reports concerning the launches in Baykonur and Cape Canaveral. The newspapers are quoting the words of General Secretary of CCCPSU L.I. Brezhnev wishing a successful flight to the crews of the Soviet and American spaceships.

Today the NEW YORK TIMES had the following headline: "The Soyuz and Apollo are in rendezvous orbit."

The London DAILY MAIL printed a report from the United States concerning the reaction of Americans to the Soyuz launch, under the headline: "Outstanding! The Soviet launch impresses America."

The Japanese newspaper ASAHI remarks that the Soviet-American cooperation in space is strengthening the atmosphere of relaxation of international tensions and is having a beneficial effect on the strengthening of peace and security everywhere.

A Telegram

To the Soviet and American cosmonauts. We are carefully watching your flight. We wish you success. Members of the International Student Construction Team of the Moscow Highway Institute Novomarkovka.

Bonn

Our correspondent in West Germany Genrikh Gurkov reports to the Press Center as follows:

"The subject of space today is the undisputed master of the airwaves in West Germany. Millions of television viewers watch the launch, which was broadcast by direct relay from the space port of Baykonur. Millions of radio listeners, when they turned on their sets, heard the familiar names Leonov and Kubasov. All of the West German radio stations begin their news programs with bulletins about the Soviet-American space experiment."

Ivanovo

Here is the report from Ivanovo:

The artists of Palekh made some new little boxes for the joint flight of the Soyuz and the Apollo. They will be presented to the Soviet and American cosmonauts, scientists, and designers.

A Telegram

Dear A.A. Leonov and V. N. Kubasov: I, a mother raising four sons alone, wish you great success in space and a safe return to Mother Earth. Please convey my greetings to the American astronauts when you rendezvous with them in your Soviet ship. Inasazarova. Baku.

Cape Canaveral

Our special correspondents Yaroslav Golovanov and Anatoliy Manakov report details of the Apollo launch from Houston:

Everyone was waiting for the spectacle on launching pad B of the launch complex number 39 of the American Space Port in Florida. By the way, Thomas Stafford, the commander of the Apollo, has most pleasant recollections of this very launch pad: it was from here that he began his last space journey to the moon in 1959.

Today, soon after waking up, Thomas Stafford and his friends first congratulated the Soviet cosmonauts on their successful launch and the beginning of their work in space. When they had finished with their traditional beefsteak and eggs, the astronauts put on their white spacesuits and were able to report that they were ready to board the ship. A man named Godoven [transliteration] helped them to get arranged in the Apollo; this space port staff member has tightened the straps for practically every American astronaut. Alas, this is his last time: on Friday Godoven will be released together with 1,800 other NASA staff members who have been working on contract, because of no further assignments.

A Telegram

Dear Space Heroes A. Leonov and V. Kubasov! We, members of the Student Construction Team imeni S. M. Kirov, congratulate you on the beginning of the outstanding scientific experiment in the history of mankind, which help to strengthen peace and mutual understanding between nations, we wish you a good balst-off, fruitful work and a happy landing. Komsomol greetings from members of the Vityaz' Student Construction Team. Leningrad.

Soyuz

Aleksey Leonov and Valeriy Kubasov, soon after entering orbit, began a series of scientific experiments.

The cosmonauts opened some heat-controlled biological capsules (Biokat) and into a nutrient placed special inserts containing micro-organisms, zone-forming fungi, and fish eggs. The task of the cosmonauts is to record their growth and development.

Enthusiasm.

One of our readers, V. Prokhorov, telephoned us and asked whether "zone-forming fungi" on board the Soyuz have any relationships to the mushrooms which will soon be in season. And at the same time he wanted to know whether Leonov and Kubasov liked to go hunting mushrooms.

The "zone-forming mushroom" experiment was reported in detail in this newspaper on 12 July. As for whether Aleksey Leonov and Valeriy Kubasov liked to go hunting mushrooms, we will find that out immediately after they return to earth. Any way, the enthusiasms of our cosmonauts and the American Astronauts are rather well known.

In addition to painting, during his leisure time Aleksey Leonov likes to take pictures and make movies; he likes hunting, water skiing, sports, and parachuting.

Valeriy Kubasov also likes to go wandering with a camera or a movie camera, also to go hunting and fishing.

Thomas Stafford is a sport enthusiast: he likes handball, weight-lifting, and swimming. Vance Brand likes jogging, swimming, skiing, and canoeing. Donald Slayton is a fisherman and a hunter.

Anyway, as far as the mushrooms are concerned, we must inform V. Prokhorov that, according to data found the Ministry of Forestry, the mushroom harvest this year will not be as good as last year. The weather is not very favorable ...

258-13-39

The following question has come in from our readers O. Minin, an engineer; G. Anufriyev, a fitter; and S. Shuppyanskya, a school girl;

also a listener from Elektrostal' V. Nefedov, also V. Glebov, a radio technician from Leningrad. Their question: How much do the spaceships Soyuz and Apollo weigh?

The answer: Soyuz weighs 6.7 tons; Apollo weighs 14.3 tons.

Houston

Yaroslav Golovanov and Anatoliy Manakov continue their report concerning the Apollo launch:

Millions of Americans have watched the progress of the space events by television. It is now the final minutes before launch. Sitting between his comrades, Thomas Stafford addresses the Soviet cosmonauts:

"We will overtake you soon ... "

"Be patient, " interrupts the television commentator. "Not so fast, you have two days to fly yet ... "

Vance Brand cannot be seen -- he is below the television camera. Stafford is in the center. He is talking with Slayton, both of them are laughing, but we cannot hear them: the transparent visors of their space helmets have already covered their faces and muffled their voices.

The count down of the final seconds begins: 9, 8, ... 0!

A Telegram

We can congratulate M.A.I. [Moscow Aviation Institute] graduate Kubasov and the crew commander Leonov on their excellent beginning. We wish for them a happy rendezvous in space. Ispytatel' Student Construction Team of M.A.I. Nakhabino.

Paris

At our request, Boris Gurnov, KOMSOMOL'SKAYA PRAVDA's correspondent in France, got in touch with one of the directors of the National Center for Space Research Daniel Mettsle [transliteration] and asked him to comment on the Soyuz and Apollo launch:

"In congratulating the Soviety and American colleagues on their successful launch, I should like to say 'thanks' to the two pioneering nations that have blazed a path into distant space. Thanks for the fact that not only the people of the Soviet Union and the United States but all the people on earth are already benefiting from the results of the labor of the first invaders of space. After all, we have been watching television broadcasts from Baykonur and Houston, and we will continue to watch such broadcasts via communications satellites, which are the direct

descendents of the first Soviet Sputnik.

"The scientists of France are proud of the fact that they were among the first to establish close cooperation with the Soviet space researchers."

258-13-39

From telephone conversations in the Press Center:

"Will you please tell us whether they are allowed to smoke aboard the Soyuz and Apollo?"

"Can you tell us whether the cosmonauts will eat soup in orbit? If they do, how do they do it? after all, liquids disperse in space ..."

London

A telephone call from the Capital of Great Britain. Our own correspondent Pavel Mikhalev has been talking with the president of the British Interplanetary Society, Kenneth Getlend [transliteration], who stated:

"During this fantastic week the world has been given the opportunity to see the Soviet Union and the United States combine all their efforts in order to prove to mankind that, despite differences in political views, people are capable of cooperating in space. After three years of training the Russian cosmonauts and American astronauts have become true friends, and now only a few hours separate them from a true 'family reunion' in space. The upcoming joint lfight will not only demonstrate the possibility of one country coming to the aid of cosmonauts of another country in times of emergency, but also the possbility of erecting large space platforms in orbit which will make it possible to carry out unique scientific experiments of great value."

The Press

A telephone call comes from our correspondent in the International Press Center, Nikolay Orekhov:

The general opinion of the journalists is that the flight of the Soyuz and the Apollo began successfully. What do the specialists think about this?

Dennis Williams a representative of NASA: "We believe that the EPAS has had excellent beginning. In accordance with the program two launches went off successfully; this is not always the case. So far, as you know, we have only had two problems: the lack of a television picture from the Soyuz and a malfunction in the hatch between the Apollo and the

docking module.

"We believe that we are capable of correcting these malfunctions."

A Telegram

We congratulate crews of the Soviet and the American cosmonauts on their successful lift-up into space. Our best wishes for success and a happy return to earth. Militia Sergeant Gladysh in the name of the komsomol organization. Yakutsk.

Film Festival

ALYY PARUS special correspondent Shchekochikhin reports from the Fifth International Childrens Film Festival:

On the screen of the concert hall in the Palace of Pioneers in the Lenin Hills an enormous rocket is departing for the constellation Cassiopeia; the count-down has begun. The engineers and designers in the Flight Control Center are standing quite still. We are watching two Soviet competition films: "Moscow to Cassiopeia" and "Boys in Outer Space."

In the corridors at the Festival you can hear a lot of talk about actual space. Children, Festival guests, and even the stern jury are talking. Loretta Pauker an American actress who is a member of the Children's Film Jury, exclaims: "Like millions of people in my country, I am delighted by the Soyuz and Apollo flight. We need such 'joint flights' in art, culture, and in medicine."

Soyuz

Last night in our press center we watched the first television broadcast from Soyuz. The malfunctions in the television system were corrected. The Americans also successfully took care of the tricks being played by their hatch. So that now on board the Soyuz and Apollo everything is working perfectly.

Aleksey Leonov says: "We're comfortable in the ship now. Everything is going according to program."

Valeriy Kubasov says: "We are now in the orbit where we will await the Apollo."

Rendevzous was getting closer and closer ...

about cooperation in the exploration and utilization of outer space for peaceful purposes, souvenir medals and badges, and also seeds of trees, which will be planted in the Soviet Union and the United States. On board the docked ships the crews will sign a certificate of completion of the docking of the Soyuz-19 and the Apollo.

The flight of the space complex Soyuz-Apollo,with an international crew, continues.

Moscow Flight Control Center, 17 July (TASS). The third working day of Aleksey Leonov and Valeriy Kubasov began today at 10 o'clock Moscow time. After arising and getting dressed, the cosmonauts checked the condition of the on-board systems, had breakfast, and set about to accomplish the program of the third day of flihgt.

By 12 o'clock Moscow time the Soyuz-19 had completed thirty orbits around the earth, including thirteen orbits in link-up orbit. The result of trajectory measurements confirmed the high accuracy of the ballestic computations and the orbital correction carried out in accordance with them. The maximum deviation of the link-up orbit from the value agreed upon beforehand with the American side was 250 meters (as against a tolerance of 1,500 meters), and the deviation in the time of arrival of the ship to the designated orbital point was 7.5 seconds with respect to the stipulated time (as against a tolerance of 90 seconds).

At 11 o'clock Moscow time the distance between the Soviet spaceship Soyuz-19 and the American ship Apollo was 1,405 kilometers. The docking of the Soyuz and the Apollo was scheduled to take place today at 19 hours 15 minutes Moscow time.

Aleksey Leonov and Valeriy Kubasov feel fine. The flight continues.

Houston, Flight Control Center, 17 July (Special TASS Correspondent) The American spaceship Apollo carrying T. Stafford, V. Brand, and D. Slayton on board continued its flight. Routine executions were executed in Apollo's orbit, corrections designed in the long-run to ensure its rendezvous with the Soyuz-19.

After correcting some malfunctions that occurred in the docking device of the command module, the astronauts passed from the command module to the docking module, where they set up television cameras, made a check of the on-board systems, and prepared them for the crucial operation involved in the docking of the Soyuz-19, which is planned for today at 19 hours 15 minutes Moscow time.

At a press conference in the Flight Control Center, it was announced that the astronauts, in accordance with the program, had carried out

a series of scientific experiments, the scope of which was somewhat reduced because of the work necessary to correct the malfunctions that occurred yesterday. They photographed and observed the earth -- in particular, they photographed the southern region of the Pacific Ocean, New Zealand and the west coast of the United States.

A number of astronomy and biology experiments were carried out, also a series of experiments with the "Universl Electric Furnace" on board the Apollo, for purposes of investigating processes of crystalization, convection and blending qualities of materials under conditions of weightlessness.

At approximately 11 o'clock in the morning Moscow time today the second 8-hour period of rest for the American astronauts came to an end. It was reported in the Flight Control Center that T. Stafford, V. Brand, and D. Slayton felt fine.

F. Littleton shift supervisor of the flight in Houston, in a conversation with the TASS correpondent said: "I'm very happy with the progress of the Soyuz and the Apollo flight. I'm absolutely confident," he emphasized, "that the crews will carry out the tasks of the joint space mission. The success of the flight largely depends on close cooperation between Soviet and American specialists on earth. "

This opinion was entirely shared by V. N. Bobkov the director of the Soviet consultation group at the Houston Center.

Work for the Sake of the Future.

Cosmonauts Aleksey Leonov and Valeriy Kubasov Answer Questions from the IZVESTYA correspondent.

> It is accomplished. For the first time in history, two ships from the leading space powers have docked, and the crews have opened the hatches to greet one another. The American astronauts T. Stafford, D. Slayton, and V. Brand, and our own cosmonauts A. Leonov and V. Kubasov prepared for a long time for this wonderful moment. Prior to the Soyuz-19 flight, the IZVESTYA correspondent asked A. Leonov and V. Kubasov to recall how they had prepared for this historic "handshake in orbit."

"Do you recall what it was like when you found out that you had been named to the same crew to take part in the experimental Soyuz flight? What did you think about first of all at that time?"

A. Leonov: "All of the cosmonauts followed carefully the implementation of the agreement signed on 24 May 1972 between the Soviet Union and

the United States concerning cooperation and the exploration and utilization of outer space for peaceful purposes. Everyone, of course, dreamed of being aboard the Soyuz scheduled to dock with the Apollo. But when I was suddenly offered the chance to become the commander of the first crew, it came as a complete surprise.

"The first thing I said after I got over my shock was: 'All of this is fine -- beautiful, and honor; but I don't know a single word of English.' But A.I. Tsarev, a representative of Interkosmos soothed to me: 'Never mind, you have two years and two months ahead.'

"It seemed to me then that I would have to work a great deal with the Apollo ship, to learn all its details. And that meant leaving my own dear town of Zvezdnyy, my family. I understood that all of it would be difficult. And I gave my consent cautiously."

V. Kubasov: "The offer also shook me up. Naturally, it was all very tempting -- a new and interesting program, detailed acquaintance with the American space technology. But it was necessary to know English, whereas I studied German in school, in the institute, and as a graduate student. And, to be honest, it was a little frightening to undertake such a responsible job."

"Nevertheless, what turned out to be the most difficult during those more than two years of training?"

The two cosmonauts answered at the same time: "English."

Aleksey Arkhipovich says: "I remember going into the classroom and seeing a teacher about twelve or thirteen years younger than me. He stood up and introduced himself in English. From that time on I never heard him speak a word of Russian. No matter how hard I tried to distract him and to persuade him, he was hard as a rock. At best he would only point to a object and give its English name. But I couldn't get these words through my head. They were absolutely alien to me. But, as the saying goes, you might as well give it all you got. I often had to sit up studying past midnight. Nevertheless, what a thrill it was later on when I became confident and the words seemed to combine into phrases that made sense. I can not especially brag about my English, but in any case the American astronauts understand us and we them."

Valeriy Nikolayevich Kubasov takes up the conversation: "The equipment was a lot easier for us. We both knew the Soyuz very well. I had flown aboard the Soyuz and had learned to control it, while Aleksey Arkhipovich had even instructed young cosmonauts in the operation of the Soyuz. It is true that the ship had been modified, and some of the things had to be learned again. We didn't know the Apollo at all. And the joint training sessions amounted to a lot of busy, complicated work. We travelled to the United States four times -- the American astronauts came to visit us three times. Each of these training sessions lasted two or three weeks. During the same time we were working jointly with specialists getting the flight ready. In addition, we did a lot of independent

training separate from the American astronauts. On the whole, looking back, those two years feel like a solid stretch of training and English studies."

"Did you take any part in modifying the ships for this flight? If so, what did it involve?"

V. Kubasov: "Of course, the actual design of the ship and its systems was the job of the specialists. We served in the role of consultants and checkers at all the stages of the ship's development -- from the first mark-up to the space port. We judged, for example, whether the control panels were convenient to use, and we determined the quality of the performance of the different on-board systems from the standpoint of operation: we also helped in selecting 'interior decorations' of the ship and the placement of the internal equipment. We followed all of the tests of the ship. There were many such tests, and some of them were lengthy. For example, the entire Soyuz ship was placed in a huge thermo-vacuum chamber where the testers checked the operation of the life-support systems for seven days. Thus, we were working hand-in-hand with specialists. At the request of our crew's commander, the American specialists installed a special docking target on the Apollo in order to operate more efficiently during the approach and docking maneuver."

"What discoveries did you make while you were in the United States?"

A. Leonov: "The main thing was that we, like Il'f and Petrov discovered that America is just one story high. The fact that generally America is imagined to be a land of skyscragers is untrue -- there are not many of them, and only in the centers of the larger cities. When you consider that I have been born and have grown up since the time of Il'f and Petrov, and many changes have taken place in the architecture, technology, and the economy of the United States, this discovery is a surprising one.

"We discovered the American people. Americans are very friendly and hospitable people; they are simple, without any standoffishness or poses. They do not like a lot of tinsel and ornament. In character they are chiefly rationalists. They try to arrange things so that life is as convenient and practical as possible. Work must not interfere with the pleasures of life. And their way of life has to help to maintain good working form. They are a very hard-working nation. They work superbly, with gusto. It is true that from childhood on they get used to counting and making money. And the most widespread measure of success in their life is money. Of course this has its bad sides and gives rise to a number of negative phenomena. But, on the other hand, it soon makes a man independent.

"We met chiefly working people -- scientists, engineers, and technicians. During our leisure time we met with fishermen, farmers, and cowboys. We sat at the same table with them, exchanging toasts in honor of friendship between our two peoples. And toward the Soviet Union and our own

people, we heard only friendly words from those we met."

"In two years you managed to get to know your American colleagues on the flight very well. Will you please tell us what opinion you have formed of them."

A. Leonov: "I came to know our colleagues earlier than Valeriy. The first one on the Apollo crew that I got to know was Donald Slayton. I met him as early as 1965 at a congress of the International Astronautics Federation. At that time he was the director of the astronaut training division. Donald at that time was attracting attention by his steadiness, persistence, and friendly way of getting along with people.

"Tom Stafford is forty-four years old, but all the American astronauts call him "grandpa" obviously its because of his kindliness and his reasonable nature. He is unfailingly polite and goodhearted. I have watched him perform on a ship. He is in complete charge of the crew; everyone knows exactly what he is to do, and everyone performs very efficiently. He himself has a superb knowledge of his job.

"Vance Brand respects all astronauts and treats them like a brother. What he likes is courtesy, frankness, goodwill, and hard work. He is a very inquisitive guy. He learned to speak Russian better than any of the others."

V. Kubasov: "All of them are good astronauts, who have at the same time received a good education. They have achieved success in life through their own hard work. And the very fact that they were included in this program says a lot. They are specialists of a high order. The entire crew is superbly trained in their job. It was simply a pleasure to watch them work."

"What significance, in your opinion, will the joint Soyuz-Apollo flight have for the future of cosmonautics?"

V. Kubasov: "This flight will open up the way to cooperation among all countries in the field of manned space flights. The new docking devices being tested on this flight constitute an extremely vital step forward in resoloving the problem of rescuing victims of space accidents. In addition, I believe that the vast program of scientific experiments being carried out on board the Soyuz and Apollo will yield interesting results. For example, whenever scientists have succeeded in photographing the sun's corona, it has always generated new knowledge. During this flight we will arrange an artifical solar eclipse, and we have reason to believe that it will turn out to be no less interesting to science, at least, than a natural eclipse."

A. Leonov: "The Soyuz-Apollo flight is a brilliant example of the fact that the Soviet Union and the Unted States can combine efforts to resolve extremely complex scientific-technical problems.

"Our role is not a large one. We cosmonauts are taking part only in the final stage of the project now completing the ambitious work done by many thousands of Soviet and American specialists. In exactly the same way, the actual flight of the Soyuz and the Apollo is just a fragment of the overall pattern of relaxation of international tensions, of the ever strengthening strivings of this planet's countries to live in peace and friendship. But this gragment is very clear and understandable to all people.

"The docking in space has sown the seeds of friendship in the consciousness of the Soviet and American peoples. I am confident that these seeds will yield an abundant harvest, and we will continue to benefit from the rich fruits of cooperation."

The Seventh Continent.

Special IZVESTYA correspondent Boris Konovalov reports from the Soviet Flight Control Center.

On the morning of 17 July the first communications session began at 10 hours 15 minutes Moscow time.

"Soyuz, this is Moscow" says Vladimir Dzhanibekov. "Good morning, how do you feel, how did you sleep?"

"We feel fine. We slept more than nine hours. How is everything on the Apollo?"

"Everything is normal; they're still resting."

After a maneuver executed during the seventeenth orbit, the Soyuz went to link-up orbit and was already ready to rendezvous with Apollo. The greatest deviation of the orbit achieved with respect to the orbit stipulated in agreement with the American side was 250 meters, as against a tolerance of 1,500 meters. The deviation in the time of arrival at the specified orbital point to begin the operation of bringing the ships close together was 7.5 seconds as against a tolerance of 90 seconds. Pressure in the compartments of the Soyuz was already lowered to 520 millimeters mercury column. The Soyuz was ready for "atmosphere docking."

The blue dot depicting the Apollo on the map of the world in the main room of our control center was approaching nearer to the red dot -- the Soyuz. The ships approached one another in accordance with the specified plan. This evening, 17 July, these red and blue dots would merge as the ships floew above central Europe.

...The television camera showed the passage module of the Apollo. The hatch was wide open. Thomas Stafford and Donald Slayton were getting ready for the meeting. Out of the orbital module of the Soyuz glided Leonov and Kubasov.

And the whole world witnessed the first handshakes in orbit between cosmonauts and astronauts, handshakes of the two leading space powers. Friendly applause broke out in the main room of the Soviet control center and all its facilities -- the second time on this historic day of docking. The day 17 July 1975 has now entered forever the annals of our planet.

Then the television screens showed Aleksey Leonov, Valeriy Kubasov, Thomas Stafford, and Donald Slayton in the orbital module of the Soyuz during this first orbital "visit" Vance Brand stayed behind on duty in the Apollo. The cosmonauts and astronauts stood close together in front of the television camera the way people do in family photographs. And indeed they are a family which lives and works on the man-made planet Soyuz-Apollo, created by the genius of the two nations. Or it may be more accurate to say that the Soyuz-Apollo represents our planet's seventh space continent.

The cosmonauts listen attentively to the words of greeting from General Secretary of the CCCPSU Leonid Il'ich Brezhnev; they thank him warmly and then, just as warmly and excitedly, they answer the questions of United States President Gerald Ford.

In a direct broadcast from our control center, Soviet television showed the United States Ambassador to the Soviet Union Walter J. Stoessel, his wife, and embassy aids, who had applauded the joint success with everyone else.

The first time applause broke out was at the moment of docking. It was the first joyful event of the historic date 17 July, 1975. The cosmonauts had first established direct communications with each other during the thirty-fourth orbit today, when the ships were above the Atlantic and were separated by 430 kilometers.

"Soyuz!" said Donald Slayton. "Good day, can you hear me?"

"I can hear you excellently. Everything is fine here!" answered Valeriy Kubasov.

The word "khorosho [fine]", was the characteristic English accent -- it sounded like "karasho" -- came to be repeated often in radio conversation. The process of approach proceeded smoothly. The Soyuz had long before been put accurately into link-up orbit. The Apollo was moving downward to the intercept trajectory and beginning decisively to close the gap. Our Soyuz with its solar battery wings, could be seen in the corner of the screens. Gradually they increased in size. The ships were approaching the coast of France. Communications were

maintained via the American tracking station in Madrid.

From the Apollo came the word: "Soyuz, begin your maneveur."

The Soyuz rotated around its axis by sixty degrees so that after the docking the antennas of the Apollo would be directed toward the American geostationary communications satellite, which revolves synchronously with the planet and thus appears to be permanently suspended above the African continent -- or, more accurately, above Kenya. We were seeing Soyuz-Apollo by means of this satellite.

By now the Soyuz took up almost one-half of the screen. A slight bump: "link-up accomplished." The ships touched one another over the Bay of Biscay at 19 hours 9 minutes Moscow time. The three guide petals of the Apollo's docking assembly nestled between the Soyuz's petals, forming a kind of "daisy" of friendship under the unbelievably bright sun of space. Then, with the force of twenty tons, the automated equipment of the docking assemblies tightened the friendly embrace of the Soyuz and Apollo, sealing the docking of the ships. Then the hatches were opened. The idea of developing standardized androgynous docking assemblies was implemented through the joint efforts of large collectives of Soviet and American specialists, and now they were being tested under operating conditions. In the future, manned ships of all countries, equipped with such assemblies, could come to the aid of one another or dock together for joint operations.

History's first "visiting" in orbit was very pleasant for the crews. The cosmonauts exchanged the United States and Soviet flags and souvenirs; and, as is proper when old friends get together, they had a friendly meal together. They "toasted" one another with black currant juice. After the meal, the cosmonauts and astronauts turned to the broad program of joint scientific work. In particular, Valeriy Kubasov, who is famed as the first space welder, began a joint Soveity-American experiment known as "Universal Furnace." In this experiment the cosmonauts were attempting to grow new semiconductor crystals having great value for electronics and to fuse materials which cannot be fused on earth. These "fusions of cooperation" will be of enormous importance not only for technology. The Soyuz-Apollo flight brilliantly demonstrates to the whole planet that people of different continents can successfully combine their efforts for the sake of shared noble purposes.

On the map of the world in the main room of our control center the individual dots depicting the ships had now disappeared. On the trajectory line their place had now been taken by the image of the docked Soyuz and Apollo.

On 18 July, after getting up and having breakfast, the cosmonauts and the astronauts again opened the hatchs of the ships to meet one another. The second exchange visit began at about 13 hours.

Soon we heard:

"Moscow this is Soyuz! Good morning. Vance Brand speaking. I am very glad to be here."

When A. Leonov went on board the Apollo, V. Kubasov said:

"So long, Alesha. See you in five hours."

In all, four mutual visits between the cosmonauts and the astronauts are planned during the joint flight.

"Everything is Very Okay!"

Special IZVESTYA correspondent Bronislav Koltovoy Reports from Houston.

These are the hours of climax of the joint flight of the spaceships Soyuz and Apollo. In the viewing room of the press center, where briefings and press conferences are generally held, it is half dark. On the huge screen we can see part of the docking module of the Apollo; in the distance is the Soyuz, looking like an airplane with blinking signal lights. It is coming closer, closer. And then -- they touch!

Experts estimate that about one billion inhabitants on earth were at that time sitting in front of television sets in order to see the "featured attraction" of the EPAS. In the large room, the success of the international docking in orbit was greeted by loud applause from journalists representing dozens of countries. A little more time went by, and then the screen showed the hatch separating the docked ships opening wide, and we heard the voice of Stafford:

"How are things, Aleksey? Please come on over to my place. Please," he said at every occasion in English.

And then: a shaking of hands -- perhaps the most unusual handshaking in the entire history of mankind. There was again an explosion of excitement in the room. Everything was truly "very okay" -- an expression which the cosmonauts had made up during training.

I will not retell in detail what I saw on the screen. The whole world was watching it. I will merely report what ordinary Americans think about the meeting in space. After the broadcast, I talked to a number of viewers at random, who in contrast to the journalists were not wearing press cards on their chest. A middle-aged official from the state of Illinois, Mr. Wright, told me:

"This is truly a great event. I am very glad that I got to see the handshake in space with my own eyes. The successful meeting in orbit is an excellent proof of the fact that our two countries can resolve the most difficult problems if they work together."

Then our conversation was joined by a doctor from California, Mr. Simmons:

"the docking of the American and Soviet spaceships I believe will benefit both our countries. What we have just seen is a symbol of friendship and cooperation between our nations. I hope that this is not the last of its kind. We have Skylab, you have the Salyut. It may be that these orbital stations will serve as a basis for the next joint venture into space."

The next micro interview I had was with a young Frenchman, Jean-Pierre Bloch, a student from Dijon. He was speaking excitedly, gesturing and smiling:

"We French people believe that the rendezvous of the two space crews is a magnificent accomplishment. They're simply fantastic! I saw the docking, saw Stafford open the hatch and shake the hand of Leonov. And I still found it difficult to realize that it was really happening."

Finally I turned to a sailor from Houston, Leonardo Bobrowski:

He said: "I think that the event which we have seen should inspire all of us with more hope for a good future. The flawless docking of the two ships in the ocean of space showed all of us that the Soviet Union and America can work together and achieve results that will astound the world."

But the people kept coming out of the room, which had been crowded during those moments when the large screen was reporting from space about the meeting of astronauts and cosmonauts on board the Apollo and the Soyuz. Everyone's face had a look of excitement; they were still amazed by what they had seen. And I thought to myself that during such times all of us, the people of earth, have a better understanding of the necessity of unity, because we can see more clearly the power of human reason, its ability to perform great deeds.

I sensed this hsared perception when I talked with James Fletcher, the director of NASA, a tall, lean man. The director of America's space programs was in full agreement with the ordinary people I had talked to:

He said: "This is a great event for all the people of NASA. The docking assembly worked perfectly. But that's not the only significance of the successful docking. The Soyuz-Apollo flight shows that two countries with differing political systems can work together and successfully resolve complicated tasks, and we are proud of the fact that we were able to demonstrate this."

"I am absolutely certain that we will have more joint flights in the future."

In conclusion Fletcher said that he highly appreciated the greetings from United States President Ford and General Secretary of the CCCPSU L. I. Brezhnev addressed to the Soviet and American cosmonauts. The thoughts expressed in those greetings, he said, are very important for all nations of the world.

Several hours after the docking took place, President G. Ford talked with the American and Soviet cosmonauts. He warmly congratulated the crews of the Apollo and the Soyuz on their great success; he was interested in the details of the rendezvous and docking in orbit. The American president asked Valeriy Kubasov about the menu in space and Aleksey Leonov about the reaction of the crews to the completed rendezvous, which took place after such lengthy preparations on earth. Leonov answered that in his opinion the joint flight marked the beginning of future joint explorations in space.

When it was already late at night in Moscow, a press conference was held in Houston to deal with the results of the day. Responding to questions asked by correspondents, a beaming G. Lanni, the technical director of the EPAS project on the American side, said:

"I don't think we need to waste words. The success of the docking speaks for itself. All of the operations went exceptionally smoothly in accordance with the program. When we started out to work together with the Russians, at first we thought that it would be too difficult: different languages, different technical methods, many other differences. But we discussed all problems frankly and looked for compromises. As a result, both teams worked out and, as the docking showed, we managed to achieve perfection in the development of the docking assembly.

The crews of the Apollo and the Soyuz performed magnificently during the docking. The same thing can be said about the interaction between the control center here in Houston and the one in Moscow."

A celebration is a celebration, but the center continued twenty-four hour operations. After the docking was completed, the specialists, with relief, picked up thick volumes from the table containing detailed instructions in case of the development of any number of "unscheduled" situations during the approach and docking of the ships. But many other books containing further programmed instructions remained on the desks. I had lay the tasks of carrying out scientific experiments, on docking, and redocking, during which the active role would be played by the Soyuz. Thus, many worries lay ahead, and undoubtedly, also many joys for all of the participants in the EPAS project.

Dialogue in Space.

Special TRUD Correspondent's Report from Houston.

Above the flight control center waves a blue flag, hoisted on the day of the launch, bearing the round Soyuz-Apollo emblem.

"I hear you fine, Aleksey," comes the voice of the commander of the American spaceship over the loud speakers of the center. General Stafford pronounces this phrase in Russian with his Oklahoma accent in response to a question asked by Leonov in English. At that time, on the main screen of the center, against a background of the outlines of the continents of earth we can see two moving lighted dots. They represent the Soyuz and the Apollo. The Russian-English dialogue in space continues. Each word is being woven into the fabric of history.

It is difficult to estimate with absolute accuracy how many people in different parts of the globe are tracking the spaceships as they make their unprecedented flight. There are several thousands. In addition to the hundreds of flight coordinators on duty at the control panels in Houston and near Moscow, space is being probed by the powerful antennas of tracking stations in Hawaii and in Ulan-Ude, in the Bermudas and in Yevpatoriya, on Newfoundland and in Petropavlovsk-Kamchatski, in the Ascension Islands, and on the ships Kosmonavkey "Yuriy Gagrin" and Akademik "Sergey Korolev." In all, the Soyuz and the Apollo are the concern of 29 control complexes scattered across the surface of the earth.

Not because it is their job, but because their heart tells them to millions of Americans are following the flight, believing that the first joint experiment of the United States and the Soviet Union will open wider not only the doors into space but also the doors of mutal understanding, cooperation, and friendship. In the United States there is an ever increasing understanding of a thought expressed by General Secretary of the CCCPSU Comrade L. I. Brezhnev to the effect that our planet is too small for military confrontations, but it is big enough for multi-lateral cooperation between nations.

Local commentators are discussing the question as to what ought to be considered the most interesting feature of the Soyuz-Apollo experiment -- besides, of course, the docking itself. Some say that it is the communication system, which for the first time connects a spaceship with earth by a artificial satellite. Others point to the fact that astronatus are speaking Russian while Cosmonauts are speaking English. And so on. But if we consider ot'.1 than purely superficial factors, the most interesting and important .eature, without doubt, is the fact that everything in the preparations for this flight was done jointly by the Russians and Americans. Both crews have in their modules absolutely identical instruction books, in which one page is printed in English and the other in Russian.

For the duration of the experiment, Admiral Alan Shepard, the first American in space, consented to serve as commentator for the NBC Television Network. This is the way he described his new job: "For me this flight represents a magnificent example, which helps my fellow countrymen to realize that space exploration serves the interests

of all mankind, no matter how this truth is distorted by some skeptics." And prior to the launch of the Apollo we heard from his lips, in Russian, the famous Gagarin expression "We're off!"

Another space veteran, a man who has been to the moon, Eugene Cernan, who is now a technical advisor for the joint flight, put it this way: "This experiment is significant not only because it involves the meeting in space of two flying objects. Of greater importance is the friendship that has developed over three years of shared efforts. This is what will benefit us in the future."

On Thursday Thomas Stafford and Donald Slayton will pass through the docking module, which is 3.2 meters long and just under 2 meters in diameter, to be the guests of Loenov and Kubasov. In addition to souvenir medals to present to his Soviet partners, Slayton will be carrying a small box that came to him from his native state of Wisconsin. The Institute of Forest Genetics there developed a new variety of pine tree known as Beloit. The Wisconsin astronaut will present seeds from it to his hosts, so that later they can be planted in the earth of Moscow. These seeds will yield excellent fruit. G. Protsenko, V. Sisenv.

A Shared Home in Orbit.

Special KRASNAYA ZVEZDA Correspondent reports from Houston.

Here in the Johnson Space Center, many prefer the Russian word for docking -- stykovka -- to the English one. Opening a press conference to deal with the results of the day, the technical director of EPAS on the American side Glenn Lanni began with the phrase: "Stykovka has taken place. It went superbly. The first rendevzous in space and hand shakes in orbit were seen by millions of people on earth."

Dr. Lanni admitted to journalists that this press conference was the easiest for him. "Whereas previously I had to memorize all kinds of complicated things that had taken place, today I come to you with empty hands. Everything went just fine. The performance of the crews and the equipment was better than excellent."

Today the Houston Center is rejoicing in the success. NASA Director D. Fletcher, EPAS Flight Director P. Frank, Astronaut D. Young, and Communications Specialist F. Littleton, despite the fact that they are busy, have not refused to give journalists brief interviews and commentaries. "Everything is going successfully. We are happy with the precision of our interaction with our Soviet colleagues. There are no technical or language problems."

The American press, radio, and television are widely commenting on the nessage from General Secretary of the CCCPSU Comrade L. I. Brezhnev to

members of the crews of the two ships, participants in the first international space flight. The words "a new page in space exploration," "a prototype of future international orbital stations," "an outstanding event" -- these words are in all the headlines, these are the words with which television reports are begun.

These days, the Johnson Center is being visited by crowds of tourists from different cities and states; Americans are coming here to "watch the space work." R. Kess, a farmer from California, said this: "All of the people in the world remember the meeting on the Elbe. That was thirty years ago. That's a long time. But you don't forget such things. This meeting in space will also go down in history. This represents a shared victory, a shared celebration, a shared pride." Mario Sereyva, a worker at the space center, dropped in right after the first exchange visit especially to express his feelings to the Soviet specialists: "I myself am a Brazilian I went to school in Sao Paulo. Now I'm working here. Brezhnev's words concerning international orbital stations and Ford's declaration that progress had been made toward future joint flights are especially significant for NASA workers. After all, that represents the future." I talked with prospects for the future with a physician from New Orleans, a student from Pasadena, and pilots from Pan-American Airlines.

It is now night time in Texas. A thick darkness covers the Johnson's Center, our hotel Nassau Bay, and the highway leading to Central America. looking toward Houston we can see the lights of neon advertising signs and the unblinking lights of automobile headlights. And somewhere up there in space, floating above the people of the earth, are the Soyuz and Apollo floating as a single unit, bound together by the 20-ton force of their docking assemblies.

The evening television stations are broadcasting bulletins about events in orbit. The announcer says that having opened the passage hatch into space people have not only paved the way toward future flights but have also opened wide the door to a world of mutual understanding, to a world of hopes and prospects. Indeed this is so. Engineers Colonel M. Reb-ov.

By Telephone and Telex and Over the Airwaves.

Report From the Moscow Press Center.

Even by the lines next to the newspaper stands in Moscow, which today are at least three times as long, you can tell the enormous interest which has been evoked by the 17 July docking of the Soyuz and Apollo and the first space rendevzous between representatives of the USSR and the United States.

Journalists accredited to the Moscow Press Center were able to follow all stages and many details of the preparations for this historic meeting.

Many of us armed ourselves with portable radios tuned to the Moscow Flight Control Center. Whether you're talking with your colleagues, reading the newspapers, examining the latest bulletins from TASS, or sitting in the room where a press conference is going on, you can get the latest information through brief but frequent communications.

Here is one conversation between earth and Soyuz not long before the beginning of the docking: "To you, Valeriy, according to Russian custom, good luck. And tell the American boys that 'we cross our fingers' (this English phrase is equivalent to the Russian "to avoid the evil eye')"

And during the first radio communication between Soyuz and Apollo, which took place at 16 hours 5 minutes Moscow time, Donald Slayton began this dialogue in Russian: "Soyuz this is Apollo. Can you hear me." Kubasov's answer came in English: "I read you well. Hello, everybody." ('I hear fine. Greetins to everyone.').

Thus, the bilingual spacemen, judging by everything, do not need the special English-Russian conversation manual which was issued specially for them in Houston.

The docking took place, as everyone knows, 3 minutes ahead of schedule. Answering journalists questions, the shift Flight Director V. Blagov explained that this happened because of the perfect functioning of the cosmonauts. Smiling he admitted that in the Moscow Flight Control Center they were most apprehensive about the playful maneuvers of T. Stafford, who has the reputation of a "speed demon.' Ideal speed for docking is "automobile speed" -- 130 kilometers per hour. It is our custom to execute this maneuver at lower speeds than the American astronauts. V. Blagov joked: "Stafford managed to convert us to his faith -- the docking was completely soft."

It was with great joy and satisfaction that the journalists who were at that time in the Moscow Press Center greeted the message to the participants of the historic experiment sent by General Secretary of the CCCPSU L. I. Brezhnev and the United States President G. Ford.

And once again the thought occured to me that in truth our planet is large enough for us to live in peace, but it is too small to subject it to the threat of nuclear war. The policy of relaxation of international tensions, the struggle to develop extensive international cooperation -- including in space -- goes toward which the Communist Party, its leninist Central Committee, and L. I. Brezhnev personally have been striving so steadfastly and systematically, have once again demonstrated their amazing results.

Yesterday the correspondents also got a chance to get acquainted with space cuisine. They were presented with a souvenir array of cosmonaut

food in tubes and in plastic. The manufacturing date was 11 July, 1975. It included cottage cheese with fruit puree, coffee and milk, and honey bread.

At today's press conference the journalists asked what words the Soviet cosmonauts used to greet their guests. The main operator of communications with Soyuz, USSR Cosmonaut pilot Hero of the Soviet Union G. S. Shonin, smilingly explained that Aleksey Leonov was in a great hurry to meet Stafford. His greeting sounded very unofficial: "Well come on, Tom, come right in!"

In explaining why the audibility during this television report from space left something to be desired, G. S. Shonin explained that the radio relay came to us by a very complicated route. From the Soyuz to the Apollo and from there to the American communications satellite, which transmitted radio signals to a station in Madrid. From Madrid to Houston, and only then to the Soviet Union. A journey of about 100,000 kilometers! Where the "weak link" was had not yet been established.

At the press center's newstand there is great demand for the book "Orbity sotrudnichestva" [Orbits of Cooperation]. It tells of the Soviet Union's international relationships in the exploration and utilization of outer space. The book came out under the editorial direction of Academician B. N. Petrov.

This evening there will be a press conference on board the ships, in which Soviet cosmonauts and American astronauts will take part. Journalists from Moscow and Houston will talk to them. A. Krivopalov.

The Flight Mirrored in the World Press.

In the Spirit of Cooperation.

"Apollo, Soyuz -- handshake in space," was the headline reporting the event in the NEW YORK DAILY NEWS. The newspaper writes: "While the world watched, two American cosmonauts met, exchanged handshakes, and gave souvenir gifts to the two Soviet cosmonauts, while their linked-up ships were flying at an altitude of 225 kilometers above earth."

NEW YORK TIMES wrote: "The United States and Soviet Cosmonauts linked-up their space ships and then shook each other's hands during the first international meeting taking place out of this world, symbolizing the wishes of both countries to cooperate in the exploration of space." WASHINGTON POST remarks: "They greeted each other like old friends, which indeed they were over the three years that elapsed after they became acquainted."

the newspapers are recording in detail the greeting from General Secretary of the CCCPSU L. I. Brezhnev to the cosmonauts of the Soyuz and Apollo, also the contents of the telephone conversation between United States President G. Ford and the cosmonauts.

As the NEW YORK TIMES pointed out, L. I. Brezhnev emphasized in his greeting that the successful docking confirmed the correctness of the technical decisions worked out and implemented in creative cooperation between Soviet and American scientists, designers, and cosmonauts. He declared that the Soyuz and Apollo represent a prototype of future international orbital stations, said the newspaper.

The British newspaper THE SUN singled out L. I. Brezhnev's statement that the relaxation of tensions and positive advances in Soviet-American relationships had created conditions for carrying out the first international space flight.

The French newspaper L'HUMANITE wrote: "The historic handshake in space between emissaries from earth constitutes a guarantee of relaxation of tension, a confirmation of the striving of nations to work to develop science and technology." "TASS".

The Opinion of Scientists.

Tatsujo Obayashi, Professor at the Institute of Space Research, Tokyo University: "The political meaning of the docking is enormous. It proves that relationships between the Soviet Union and the United States are becoming more solid, more multi-lateral.

"As a scientist, I see in the docking of the Soyuz and the Apollo the basis for man's future advance into outer space. And from this point of view the meeting of the space ships represents to me an achievement which is capable of having a beneficial effect not only on the Soviet Union and the United States but also all mankind."

Bernard Lovell, British Astronomer: "I believe that the main thing in this event is the realization of international cooperation between two great space powers.

"The Soviet Space Program is, historically, extraordinarily important. And there are indications that in the future, in the next ten, fifteen, or twenty years the Soviet Space Program will become increasingly broad. We expect that scientific instruments will be sent to different planets and that men will be able to penetrate even deeper into the solar system."

Guillermo Seberon, Director of the National Autonomist University of Mexico City: "The flight of the Soviet and American cosmonauts represents an event of exceptional importance. Its significance consists above all in the fact that countries having strained relationships in the past during the atmosphere of the so-called 'coldwar' are now cooperating to explore space.

It seems to me that this indicates that mankind can take an optimistic attitude toward the possibility of mutual understanding, when it concerns positive events."

R. Soloukhin, corresponding member of the Academy of Sciences USSR, Director of the Institute of Theoretical and Applied Mechanics, Siberian Department of the Academy of Sciences USSR: "The world is excited by the great scientific and political event -- the beginning of the unique international experiment in space. The world is amazed at the precision and efficiency of the performance of all the technical devices developed by the meticulous labor of scientists, engineers, and workers of the two leading space powers, who have combined their efforts to explore outer space for peaceful purposes.

"People are proud of the bravery of the Soviet and American cosmonauts. And even though this is just the first handshake in space, the first joint experiments in the field of space biology, spectroscopy of solar phenomena, the check of technical docking devices, and joint maneuvering of two spaceships, it is clear that we have before us a systematic and intensive shared job. It will help to reveal new secrets of nature, to make more rational use of the sources of our planet and of space.

"The handshake in space lays the groundwork for the success of peaceful effort of progressive people in all countries on the way to develop peaceful cooperation, mutual trust, and business-like contacts.

"Success to you, five brave men! And a safe return to your homes on earth!"

Chronicle of the Day. Reports from the KOMSOMOL'SKAYA PRAVDA EPAS Press Center

Soyuz

Aleksey Leonov and Valeriy Kubasov answered the question: "What do you expect from the joint flight?"

A. Leonov: "Most of the participants in the experiment have already been in space. And each one believes that the most astonishing impression from a flight is the view of earth through the porthole of a spaceship. Our blue planet is beautiful at a distance, and it evokes a flood of lyrical moods. I believe that in our meeting in orbit with the American cosmonauts we are exchanging not only the first handshake in space but also a promise to safeguard the planet earth, to work together to make it flourish."

V. Kubasov: "The Apollo-Soyuz flight responds best to the spirit of our times, which is marked by relaxation of tension in the world and strengthened wishes on the part of nations to cooperate."

Not long before the flight, TASS correspondents L. Arkelova, and N. Zheleznov asked Aleksey Leonov this question: "What have you prepared to say to Thomas Stafford when you shake hands in orbit?"

Leonov answered: "That's a secret now. I can just tell you that our first handshake in space will be a firm one."

The events of this day have confirmed to this. And Aleksey Leonov revealed his "secret" ...

A Telegram

Congratulations on the successful beginning of the joint Soyuz-Apollo flight! Good wishes for a successful docking! We are proud of our country's successes in exploring outer space. Students of the Young Cosmonauts School imeni V. M. Komarov, Syzran' City Committee of the Komsomol.

The Press

Quite naturally, the World Press has been focusing special attention on the Soviet-American experiment in space.

Some quotations from the newspapers:

"This experiment can hardly fail to excite even those who generally remain apathetic to space exploration. In the broad sense it represents a test of the readiness of both countries to cooperate in future space exploration." These are the words of the WASHINGTON POST.

MAGYAR NEMZET writes: "World-wide cooperation during the current flight will enrich mankind with significant achievements, to say nothing of the future, when both great powers will carry out new and even more ambitious space experiments."

The Valenzuela newspaper UNIVERSO writes: "The event of the century -- the meeting in space between the Soyuz and Apollo spaceships -- is taking place in the name of peace."

Soyuz-Apollo

The draft project of the EPAS fills more than one hundred volumes of technical documents. Before the ships actually appeared in space along with the docking assembly, the scientific and technical experiments,

thousands of people in the Soviet Union and the United States ran through this flight in endless calculations, lines on blueprints, in factories, and in scientific-research institutes.

And when we today are delighted with the excellent performance of the space crews in orbit, let us not forget that alongside the cosmonauts and astronauts there are thousands of people who are not merely witnesses but also participants in this historic experiment!

Moscow

Valeriy Lutskiy, a staff member at the Moscow Planetarium, is issuing an invitation to a lecture dealing with the Soyuz and the Apollo. He informs us that the Planetarium has installed an optical instrument which makes it possible to show all stages of the docking against a background of starry sky.

There's time -- come on in!

Houston

Our special correspondents Yaroslav Golovanov and Anatoliy Manakov report from Houston:

NASA staff members, working in the main hall of the Flight Control Center, with whom we had the opportunity to converse at the end of their working day, said that both flight control centers -- the Moscow one and the Houston one -- had already exchanged an enormous amount of exceptionally vital information concerning the workings of the ship's systems and the trajectories of their flight. In their opinion, cooperation with the Soviet specialists had been "productive and pleasant to the highest degree." In the shared opinion of the directors of the center, the flight was proceeding successfully.

Philately

Experienced stamp collectors have long since known that unsystematic collection of stamps is a senseless occupation. It is much more reasonable to collect stamps in accordance with themes. Thus there have come into being collections devoted to flora, fauna, art, the history of technology, and great geographic discoveries. It was possible to collect all such stamps last century also. But there are some collections which could only begin during our times: they include stamps devoted to space. Now, space stamps are among the most popular.

Stamp collectors collecting stamps on this theme can again expand their collection: The Ministry of Communications USSR has issued a series of four stamps and a block of stamps devoted to the Soyuz-Apollo space experiment. The United Stamps has also issued stamps commemorating

the joint flight. These stamps depict the ships at the moment of docking.

258-13-39

V. Grigor'yev, a reader of ours, asks why it is that the Apollo is the active ship while the Soyuz is the passive.

Well, first of all when two ships are in space one of them has to be the active one and the other passive. If both of them were active at the same time, how could docking take place? Incidentally, V. Griger'yev has not paid enough attention to the flight program: during the first docking the Apollo will be active, whereas the Soyuz will be active during the secon .

It's also possible that there could be some emergency situations in which the Soyuz would have to be active during the first docking as well. In particular, such a possible situation was run through during the training sessions at the Flight Control Centers in May of this year. But that's just in case there is a change in the basic flight program.

London

Our correspondent Pavel Mikalev reports some amusing information:

"In all of England there are no happier people today than the inhabitants of the town of Bognor. It's name today is on everybody's lips. The scientists have calculated that the 'handshake in space' of the Soyuz and Apollo is taking place up above England, in fact right above Bognor. There were, of course, some skeptics who declared that it is impossible to determine the geographical point of rendezvous in the sky for spaceships travelling at a speed of 17,500 miles an hour ... but no such critical voices were able to cool the fiery enthusiasm of the inhabitants of Bognor, who found out over their local radio that they were at the epicenter of truly world-shaking events.

"The town did not sleep all night but instead spent the time tidying up the streets, avenues, and homes. They sent greetings to the cosmonauts. The Soviet and American national flags were hung on the building of City Hall. A memorial flag has been prepared to affix to the City Hall in honor of this historic event in the life of Bognor."

Houston

Yaroslav Golovanov and Anatoliy Manakov report on a press conference in Houston:

"No, there never has been one yet and, obviously, there could not be a space flight in which some problems did not arise," said the technical flight director in Houston Pete Frank. "The main thing is to be able to

correct them. EPAS is going superbly, the Apollo has executed the planned correction in its trajectory. It is very close to the calculated trajectory, which inspires confidence that the docking of the ships will be successful.

When one of the American journalists asked Littleton whether it was expectable that a second Soyuz ship would be launched, he shrugged his shoulders in puzzlement:

"At present there is no necessity for that, and such a launch is not stipulated in the program."

We also were asked about our second back-up ship by the Americans, who said that they had even heard that one had been launched. It took considerable time to get to the bottom of this strange information. The guilty party turned out to be ... Valeriy Kubasov! Because the flight engineer's call name is "Soyuz-2" -- they were confusing Valeriy with the ship. No, Pete Frank is right: it is really beyond human power to foresee everything!"

A Telegram

We, representatives of different people, students at the Kishinev State University, student delegates from Bulgaria and Vietnam, witnessed the exciting moments of the historic launch. We are delighted! May this docking represent a handshake in space among our nations for the sake of peace on earth. Members of the Inter-75 International SSO [Expansion unknown]. Village of Chebanovka, Moldavia.

A Sensation

A sensational bulletin: There is a "stowaway" aboard the Apollo!

We were just informed that a Florida mosquito got into the cabin of the spaceship illegally and for some time managed to keep hidden. In space it came into the field of vision of the cosmonauts, and they immediately reported the incident to earth.

After a brief hunt, the fate of the presumptious mosquito was sealed.

258-13-39

V. Sizov, a pensioner from Moscow, G. Rubinchek from Odessa and many other readers have asked: When will it be possible to observe the docked spaceships Soyuz and Apollo?

Here's our answer: The orbit in which the docking takes place does not run higher than fifty degrees northern latitude. For this reason it is not worthwhile to look for the ships in the sky. Thus, for those who live south of that latitude it makes no sense to try to catch sight of the Soyuz and Apollo.

A Telegram

The Pioneer-Komsomal Detachment imeni Gor'kiy of the city of Volgograd congratulates the crew of the Soyuz-19 spaceship on opening up a new era in the history of space exploration. We are proud of you, dear heroes of space, Leonov and Kubasov! Honor Guard at the Eternal Flame of the Hero City of Volgograd.

Apollo

Yaroslav Golovanov and Anatoliy Manakov report on details of the Apollo flight:

The medical services at Houston were especially attentive during the second day of flight. After all, Deke Slayton and Vance Brand are on their first flight. How are they doing during the period of adaptation to conditions of weightlessness? The whole Apollo crew, according to telemetry data and the reports of the astronauts, feels fine and is working productively. Their appetite is also excellent. Stafford reports that he ate all his daily menu, with the exception of the pastry, which he declared to be inedible. Brand also ate everything except the fruit cocktail, which he could not find. Slayton did not eat the traditional American steak -- beefsteak -- but he did not say why. Although weightlessness is hospitable to astronauts, it is difficult to get around in that strange world without some amusing incidents. While opening a package of strawberries, Brand spilled all of them out, and they stuck to him on all sides.

"The whole ship is strawberry red," came the cheerful report from Apollo.

The question from Houston: "Well, how does it smell now?"

"Don't worry, there aren't very many," said the astronauts. "Finally, through joint efforts, we trapped some of the berries and ate the rest."

The Press

Nikolay Orekov, our correspondent at the International Press Center, reports:

"A briefing has just been concluded; the shift flight director S. Tsybin answered Journalist's questions."

The Polish Press Agency: "Can we say that today is the most important day of the flight?"

Answer: Yes, because its success determines the success of all of the subsequent experiments aboard the Soyuz and the Apollo.

Prague -- Moscow (Czechoslovakia): "Who in the Flight Control Center will be the operator in charge of communicating with the Soyuz-19 crew during the docking?"

Answer: Shonin. The director on this shift is Kravets.

Polish Press Agency: "Is it just accidental that the operators in the Flight Control Center are all cosmonaut pilots?"

Answer: No, to this duty we specially assign back-up cosmonauts or else cosmonauts who have undergone training in the same group as the crew of the spaceship. They have an excellent knowledge of the flight program and can easily understand any situation.

Docking!

Rendezvous Orbit ... They came to this spot by different routes. First the distance separating them was thousands of kilometers -- they were launched from different shores. Then the distance diminished to hundreds of kilometers, then hundreds of meters ...

And now we can see them on the television screen: the steep side of the Apollo and the Soyuz, which has opened up the panels of its solar batteries like the rings of an airplane. So rapidly and confidently have they found one another ...

The ships come closer and closer to each another ... The emptiness between them gets smaller ... A final movement, the final centimeters of a long journey -- and now they have touched ... Another instant and the ships are connected.

After that both crews set about checking the seal. The first check indicated that everything was normal.

They began to prepare for passage. Soon the hatch would open, and the American astronaut would glide into the Soyuz.

And so they finally met.

Leonov: "The docking is tight! The docking is completed!"

Kubasov: "At 19 hours 4 minutes and 47 seconds we began to rotate around our longitudinal axis. Then there was a slight bump and the signal light went on indicating 'link-up'. Vance Brand told us that the tightening mechanisms were turned on."

258-13-39

The first telephone call to our Press Center after the docking was completed came from Petya Grishin of Moscow, age 7:

"Tell them they are fine fellows!" (Reported from the KOMSOMOL'SKAYA PRAVDA Press Center by V. Gubarev and L. Repin.)

18 July 1975. A Day of Opened Doors. TASS Bulletin.

After the successful execution of the main stage of the joint flight -- the docking of the Soviet spaceship Soyuz-19 and the American spaceship Apollo on 17 July, the first international space complex has been functioning in earth orbit; it is piloted by Aleksey Leonov, Valeriy Kubasov, Thomas Stafford, Vance Brand, and Donald Slayton.

Three hours after the docking, the Soviet cosmonauts opened the hatch of the tunnel between the Soyuz-19's orbital module and the docking module of the Apollo, and the ship's commanders Aleksey Leonov and Thomas Stafford exchanged the first handshake in orbit. After that Thomas Stafford and the pilot of the docking module Donald Slayton went over on board the Soviet spaceship Soyuz-19.

At 22 hours 24 minutes, greetings from Comrade L.I. Brezhnev were radioed to the crews of the Soyuz-19 and Apollo ships. On behalf of the Soviet nation and himself personally General Secretary of the CCCPSU L.I. Brezhnev congratulated them on this remarkable event -- the first docking of Soviet and American spaceships, and the expressed best wishes to the crews for a successful carrying out of the planned program and a safe return to earth.

The Soyuz-19 commander A.A. Leonov expressed heartiest thanks to the CCCPSU and Comrade L.I. Brezhnev for his kind message, also high praise for the work of the Soviet and American scientists, designers, and cosmonauts. We are very gratified by the warm words of Leonid Il'ich, said Aleksey Leonov, and we will work even better. We have a lot to say to Leonid Il'ich in response to his exciting words, and we cosmonauts will express to him our sincere feelings of gratitude once more when we meet him personally back on earth.

Then the United States President G. Ford addressed the international crew with a message of greeting; he wished them success in their joint efforts in space.

On board the Soyuz-19, the Soviet and American cosmonauts exchanged the state flags of the USSR and the United States, and they signed a certificate of the International Federation of Aviation Sport concerning the first international docking in space. The Soviet crew transferred to the American crew the United Nations flag, which on completion of the flight will be carried jointly by the cosmonauts and the astronauts to the United Nations.

After the first exchange of visits by cosmonatus, Donald Slayton and Valeriy Kubasov began a joint scientific experiment in the docking module using an electric smelting furnace. The crews exchanged instruments designed to carry out biology experiments.

On 18 July at 12 hours 5 minutes Moscow time the second exchange visits by the cosmonauts began. On board the Soyuz-Apollo complex they continued joint scientific experiments in accordance with the program mapped out by both sides.

Aleksey Leonov went on board the Apollo and will stay there six hours. The program of his visit on the American ship involves a variety of things. He will study the equipment, the apparatus, and the operation of the Apollo's on-board systems; he will check the communications wiring between the ships and make movies.

During his visit aboard the Apollo A.A. Leonov will continue to sign joint documents together with the American cosmonauts. He will join the metal plates carried by both ships into a single commemorative plaque symbolizing the Soviet-American cooperation in space.

During those hours, aboard the Soyuz-19 ship Valeriy Kubasov and Vance Brand will be working in accordance with the established program.

At 20 hours 30 minutes, when the Soyuz-Apollo space complex was located above the border between the Soviet Union and Poland, an on board press conference began. It lasted one half-hour and came to an end when the Soviet and American cosmonauts were flying over Australia. The press conference was conducted simultaneously from the Soyuz and the Apollo. The correspondent's questions to the men in space were transmitted by operators at the Moscow and the Houston Flight Control Centers.

The work of the Soviet and American cosmonauts is proceeding in a friendly atmosphere, precisely and smoothly, with full mutual comprehension.

The space flight of the Soyuz-19 and the Apollo and the experiments being conducted by their crews testified to the broad possibilities for cooperation between peoples of different countries in the interest of peace and progress for all mankind.

Working Days on the Manmade Planet.

Special IZVESTYA Correspondent Boris Konovalov reports from the Soviet Flight Control Center.

Everyone who sat and watched the television set on 18 July saw the cosmonauts and the astronauts in a variety of combinations. First, Aleksey Leonov went over onto the Apollo while Vance Brand went to the Soyuz. Then Aleksey Leonov and Thomas Stafford did some work on board the Soyuz, and Valeriy Kubasov worked on the Apollo.

Through all these shufflings and reshufflings of the crews we saw that they were working equally smoothly and felt equally comfortable in all of the compartments. This has not been an illusion. If, after one of the exchange visits, an emergency arose and it was necessary to urgently undock, the cosmonauts and astronauts would return to earth in the same group in which the unforeseen emergency caught them. This was agreed on prior to the flight. The Soviet cosmonauts have studied the Apollo so well, and the Americans have studied the Soyuz so well, that they can substitute for one another and work in mixed crews even during an emergency landing.

During the first visit by the American astronauts they signed their autographs on three books by the founder of cosmonautics Konstantin Eduardovich Tsiolkovski, which were published at the beginning of the twentieth century -- a century which is now known as the century of space. These books are: "Issledovaniya mirovykh prostranstv reaktivnymi priborami." [Exploration of Space by Means of Jet Devices],"Tseli zvezdoplavaniya" [The Goals of Space Navigation], and "Kosmicheskiye raketnyye poyezda" [Space Rocket Trains].

In "The Goals of Space Navigation" K.E. Tsiolkovski expresses the thought that one of the major goals in space exploration should be "space settlement." Now, two space islands are circling our planet in the sky: the Salyut-4 and the Soyuz-Apollo, the latter with history's first international crew. These "islands" are prototypes of the enormous "archipelagos" which will in time be built in earth in interplanetary space.

The docking, the exchange visits, the reports by the cosmonauts and astronauts, and the press conferences have inevitability over-shadowed the extensive scientific work being done on board the ships. The slightest opportunity is taken advantage of to set up an experiment suitable for the future. For example, during the exchange visits of the cosmonauts there was a "microbe exchange" experiment. Every human being lives in harmony with billions of "his own" micro-organisms, but it is quite possible that micro-organisms "beneficial" to one man will be harmful his colleagues. Much is changed under space conditions and

now, with the exchange visits of the crews, they are simultaneously checking on how micro-organisms "mix together."

The actual undocking of the ships, which is scheduled to begin at 3 o'clock in the afternoon of 19 July, will be utilized for the purpose of arranging an artificial solar eclipse in space -- the first such eclipse in history arranged by man. This will make it possible for scientists to get a better understanding of the sun's corona in whose atmosphere these "space islands" are actually flying

After the undocking of the ships, they will again come together to make a final check of the docking assemblies. This time the active role will be played by the docking assembly of the Soyuz. And at 18 hours 30 minutes the final undocking of the ships will take place. Even the leavetaking of the Soyuz and the Apollo will help science: At that time they will carry out the "ultra-violet absorption" experiment, which will make it possible to determine the concentration of atomic oxygen and nitrogen in outer space at the altitude of the flight.

Meanwhile, on the morning of 19 July, at the same time as the first conversation was going on between the Control Center at Aleksey Leonov and Valeriy Kubasov after they woke up, on the screens of the Center we were watching the descent of a parachute to earth: a search and rescue service was training at the landing site in Kazakhstan. The Soyuz was scheduled to return to earth on 21 July.

At 11 o'clock in the morning on 19 July, Anatoliy Filipchenko and Nikolay Rukavishnikov, Soyuz back-up crew cosmonauts, who had just arrived at the Control Center from the Space Port took their places next to the main operator in charge of communications Georgiy Shonin. When the Soyuz-Apollo station entered the zone of radio visibility of the Soviet tracking station at Ulan-Ude, we were able to visit the animated conversation of these two cosmonauts -- the first to pave the way into space for the modified Soyuz ship, men who had tested in orbit the new docking assembly during the Soyuz-16 flight, and heroes of today.

"Soyuz, how do you read me? This is Filipchenko. How are things up there?"

A. Leonov answers: "Everything is fine so far."

"I think it will continue that way. Your families have asked us to convey their best wishes. They're excited. They are anxious for you to return."

"What do they have to be excited about?" remarks Kubasov. "Everything is normal."

"How are your colleagues?"

Kubasov says: "They were exhausted last night, it was a difficult day."

Filipchenko says: "Say a big hello to them from us."

Rukavishnikov concludes the conversation: "So long, we are anxious to get together with you again."

After the undocking, the cosmonauts and astronauts will be carrying with them souvenir medals, the two halves of which were joined together in space during the final exchange visit by the crews on the evening of 18 July. Now these medals have become a single piece: the front-side shows the combined flags of the USSR and the United States, while the backside shows the connected images of the Soyuz and the Apollo. Our cosmonauts will also carry with them back to earth the seeds of trees presented as gifts by the American astronauts. I do not know exactly what trees these seeds were taken from. It may be that they were already full-grown trees when the soldiers got together on the Elbe, or it may be that the trees had just started out in life then. But I should like to believe that the seeds brought back to earth from space will not only give life to new trees but also, together with the life-giving oxygen they bring to the planet, enlarge the atmosphere of friendship and harmony.

Living Strands of Communication.

Special IZVESTYA Correspondent Bronislav Koltovoy reports from Houston.

What would you think about a man who, in response to your question as to what time it was, answered: "Probably about 75." Under ordinary circumstances on earth, as you can see, this would sound strange at the very least. But in Houston now time is being counted in a special way. It is being counted from the second when the rocket carrying the Soviet spaceship Soyuz headed upward: a new chronology was begun.

And so here in the Press Center it did not at all sound strange when it was announced that at 77 hours the five men in space would give a press conference for the world's journalists. Cosmonauts and astronauts are experienced people, they are resourceful, and they do not have to search hard for words. I believe all the viewers have appreciated the reasonableness of the statements by the Apollo Commander Thomas Stafford and the answers and banter, spiced with jokes, of our Commander Aleksey Leonov. People on earth will remember the bold dreams of Kubasov concerning factories in space, the thoughts of Brand concerning joint flights to some planet or other, and the brief answers of Slayton. The very unusualness of the site of the press conference and the extraordinary number of people in the audience heightened the significance of every phrase.

In just three hours the evening newspaper HOUSTON CHRONICLE came out with a report about the press conference. It especially singled out the words of Stafford: "When we opened the hatch separating our ships, we

were opening a new era for earth in the history of mankind. How this era will develop depends on the decisiveness, the accomplishments, and the faith of the peoples of our two countries and the entire world."

How Beautiful Earth Is!

Report from the Moscow Press Center.

Space intrudes in our life sometimes in most unexpected ways. It introduces adjustments even into diplomatic etiquette: Let us recall that the handshake on the outer space level between representatives of the two countries was planned by means of computers with an accuracy down to the minute many months before the rendezvous in orbit; this could only have been dreamed of by even the most jaded masters of ceremonies of the past and present. The on-board press conference with the Soyuz and Apollo crews that took place on the evening of 18 July also had a distinctive space flavor.

Start with the fact that participants in the press conference were separated by hundreds of thousands of kilometers -- Moscow, Houston, and orbit; the team of journalists -- several hundred people -- truly represented the press from around the world. The questions (selected by a specially-formed international committee of journalists because of the lack of time) were answered by the first international star crew, a crew which was able to use with some facility two languages -- Russian and English. It is estimated that the press conference was witnessed and heard by one billion people on earth. If all that isn't the stuff of fantasy, then it certainly verges on it!

But let us return to the conference room of the Moscow Press Center. Like every experiment carried out by the Soyuz and Apollo crews, the conversation between the cosmonauts and the journalists was preceded by thorough preparations. Hundreds of Soviet and American scientists, engineers, technicians, and workers prepared for the press conference with the same meticulousness as, for example, the experiment with the "Universal Furnace." The intensity of the preparations could be felt when one listened to the radio conversations between Moscow, Houston, and orbit. The sounds of Russian could be heard -- the strange mixture of Russian and English words.

And now finally the floodlights went on in Moscow and Houston; color television screens flickered into life: A. Leonov and T. Stafford were "receiving" journalists on the Apollo, while V. Kubasov, D. Slayton, and V. Brand were in the orbital module of the Soyuz.

The space conversation with earth began with a declaration by T. Stafford.

"We are happy to be working today in space in accordance with the EPAS program. The success of the flight which America, the Soviet Union, and

the rest of the world are watching today is the result of the will, cooperation, and efforts of the governments of our two countries, the directors of this program, and the engineering-technical workers and other specialists. Yesterday when I first opened the hatch and said hello to Valeriy and Aleksey, the thought occurred to me that while opening hatches into space we are opening up a new era in the history of mankind. I am confident that this era has a good future."

Then A. Leonov had this to say:

"We, the representatives of two countries, are carrying out this joint flight because our peoples and our governments want to work together in a spirit of cooperation, because many specialists in the United States and the Soviet Union have invested enormous efforts in the realization of this flight.

"The flight has become possible in a climate of relaxation of international tensions and developing cooperation between our countries. This flight represents an important step on the endless road of exploring outer space with the combined efforts of all mankind."

Even during the hours of space celebration, people think about the fate of our native planet. D. Slayton, a veteran of World War II, was asked how Europe appeared to him -- a continent over which he had flown during the war years.

"Although many sections were covered with clouds, nevertheless how beautiful earth is!"

Journalists asked V. Brand what news he would like to hear from earth. The astronaut answered that he would like to hear good news: "we would like our joint flight to have a beneficial influence on the political climate in the world, so that good news can derive from our flight."

It is well known that V. Kubasov is very fond of his children and spends a lot of time on educating them. Undoubtedly this is the reason why he was asked what he would like to wish for all children on earth.

"I should like to wish happiness for all children, that they may never lose their fathers and mothers."

In recent years the press has frequently discussed the problem of financing space expeditions. Thomas Stafford was asked for his opinion -- whether the joint flight justified the expenditures, considering the problems on earth. The commander of the Apollo answered that in terms of science both sides had gained a great deal from this flight and "in the long run the benefits that the flight has yielded will pay for all expenditures, and, undoubtedly, will have a beneficial influence on relationships between our countries."

The journalists were also interested in knowing about the experience gained from the joint flight. The gist of the answers was that the joint flight had shown the possibility and desirability of international cooperation in space. One of the main tasks of the experiment had been successfully completed: the standardized docking assembly was tested and, therefore, a first step had been made toward the development of a reliable means of rescue in the event of an extreme emergency in space. The flight also showed that in the future it will be quite possible and, obviously, economically advantageous to plan joint space expeditions.

Being aware of Leonov's artistic talent, the journalists asked him to transmit to earth a sketch of a drawing which would express the meaning of the joint Soyuz-Apollo mission. Leonov immediately showed the combined flags of the Soviet Union and the United States. Applause broke out in both Houston and Moscow. Then Aleksey showed sketch portraits of his comrades in the flight. Such was the occasion of the showing of the first art mini gallery out of this world.

When people go visiting, it is generally the custom afterward to ask what they had to eat. Leonov also had to face this question. Here is his answer (to the general satisfaction of the journalists):

"Space food is not the same as what people eat on earth; [In English:] but, as the ancient philospher said, 'a meal is not so much what you eat as with whom you are eating.' Today I had dinner with my very good friends Thomas Stafford and Donald Slayton."

Although the joint flight has not yet come to an end, the press asked A. Leonov and T. Stafford the traditional journalistic question about the cosmonaut's plan for the future: "What space flights would you like to participate in?"

To this Leonov answered that he was deeply convinced that everyone now -- both those flying in spaceships and those not flying in spaceships but watching the astronauts and listening to them -- are participating in just the beginning of man's long journey into outer space. A. Leonov remarked: "Naturally I would like to be on some spaceship again flying for a long time around the earth in order to look with the eyes of an artist on the multi-faceted face of our earth, its multitudinous colors, to imprint it on my memory, and to convey it to people. I should like to be at altitudes greater than those where we are flying now. From there, earth will look completely different."

Answering the same question, T. Stafford said: "Naturally I would always like to fly on more advanced equipment, to take part in new flights. Not much time remains before the beginning of the 'Spaceshuttle' program and, naturally, I would like to participate in that program. I hope that Aleksey will have a spaceship by that time designed for a new joint flight. Mankind is proceeding along the road of progress. There

will be no space equipment. I hope that joint flights will make use of new, improved space technology that will yield great benefits for all of us on earth." A. Krivopalov, M. Rostarchuk.

What Joan Brand Dreams About.

Special TRUD Correspondent Reports from Houston.

It was about noon. In space, "operation fourth visit" was coming to an end. Valeriy Kubasov and Vance Brand were getting ready to move from the Soyuz to the Apollo. At that time your correspondents were in the cab of a green Dodge truck about forty kilometers southeast of Houston. We were headed toward the construction site of the Brook Forest housing complex; behind the wheel sat construction supervisor Joan Brand, the wife of the astronaut piloting the command module.

We had met in the office of the small house construction company Stuart Homes not far from Brook Forest. The company's owner, a thick-set Arkansawyer named George Stuart, said that Joan was a "God-send." "If she, with her conscientiousness and energy, should suddenly take it into her head to leave, I would have to hire three to replace her."

On the walls of her office are samples of wallpaper, linoleum, other construction materials, a panel with different door handles and latches. The usual construction supervisor's office. The only thing that indicates that an astronaut's wife works here is a miniature black and nickel speaker connected with the selector of the Flight Control Center. NASA administration has taken care to see to it that Joan is constantly posted on the space experimment. Our conversation had hardly begun when the speaker announced the beginning of the "fourth visit." Mrs. Brand turned the sound up louder.

"Are you excited, Joan?"

"What can I say; I don't think anything bad will happen to Vance. I just don't think so. Before he became an astronaut he tested airplanes for Lockheed for a long time. I had to teach myself not to keep expecting accidents, otherwise I couldn't have stood it."

"You accompanied him to Cape Canaveral. What did you say at parting?"

"I told him he had earned this flight. Vance prepared nine years for it. That's his way -- he does everything all out. That's the way he took up Russian. But in general, at such times we try not to be too pompous."

We asked her what her husband thought of her "masculine profession." She laughed.

"Sometimes he grumbles that I give too much time to my work, but in general he knows that I'm just like he is -- I try to do everything all out. When the children were small I gave all my time to them; now they are older and I can make use of my skills. And I don't want people to think that I'm just an ordinary person in construction."

While we were in her supervisor's van, the black speaker, with the voices of Brand and Kubasov, was announcing the stages of their exchange visits. Joan would sometimes stop in mid-sentence and listen. Then, excusing herself, she would return to our chat. She expressed her thoughts without a lot of words. We asked her what she thought about the experiment which her husband was carrying out together with Soviet cosmonauts. Without any hesitation she said definitely and precisely:

"I do not want my children to know what war is. Anymore than the children of the Russian cosmonauts. Americans have to be friends with the Russians. That's what Vance thinks and that's what I think ..."
G. Protsenko, V. Sisnev.

The Flight In the Mirror of the World Press.

At the Focus of the Planet's Attention.

"The joint flight in space, in addition to the fact that it will enrich mankind with important knowledge, is at the same time the kind of scientific undertaking which is inseparable from the normalization of relations between the Soviet Union and the United States. At the same time it reflects the success of the policy of peaceful co-existence and promotes the development of this process." (NEPSZABADSAG, Budapest)

"The docking of the Soyuz and Apollo sets a historic precedent which undoubtedly has a beneficial significance for all mankind." (ULTIMAS NOTICIAS, Caracas).

"There can be no question that the meeting of the two spaceships has become a symbol of peaceful co-existence on our small globe." (ZYCIE WARSZAWY).

"The current space experiment is helping to alleviate tension between the Soviet Union and the United States." (MAINICHI, TOKYO).

"The joint Soyuz-Apollo flight is a new and brilliant expression of the systematic eff[illegible] of the Soviet Union to make use of the achievements of science and technology for the sake of peace and mutal cooperation among nations. It opens up new horizons in the peaceful exploration of outer space." (UNEN, Ulan-Bator).

"The Soyuz-Apollo project opens the way to future joint undertakings in space. As soon as the basic barriers are eliminated thanks to the current program of the joint flight, we may begin to speak of further manned space flights in earth orbit on huge laboratories, as well as joint unmanned interplanetary expeditions." (FINANCIAL TIMES, London)

"In the history of world cosmonautics there are days which will be remembered forever, events which never will be forgotten by the people of our planet. Among them is the remarkable date 15 July 1975, when the first joint international space flight began." (RABOTNICHESKO DELO, Sofia).

"Everyone understands that the launch of the Soviet and American spaceships represents something larger than simply a space experiment. It testifies to the fact that the international situation has changed and is developing along lines of cooperation in all spheres." (PAESE SERA, Rome).

"The launch of the spaceships -- the Soviet Soyuz and the American Apollo -- is one more of many proofs indicating the relaxation in the relationships between the Soviet Union and the United States. This fact reflects other aspects of cooperation between the Soviet Union and the United States, the consequences of which are perfectly clear both for science and for strengthening peace. The current experiment has combined the efforts of two powers, which will increase our knowledge of outer space." (EXCELSIOR, Mexico City).

"The new space experiment is of great symbolic meaning. It is a confirmation of the fact that the 'coldwar' is over." (DAGENS NYHETER, Stockholm).

"The joint flight of the American and Soviet ships is the result of a policy of peaceful co-existence and a symbol of relaxation, without which cooperation in the field of space exploration would be inconceivable." (L'HUMANITE, Paris).

Chronicle of the Day. Reports from the KOMSOMOL'SKAYA PRAVDA EPAS Press Center.

Soyuz-Apollo

And so, they have met.

Donald Slayton grasped the handle of the hatch and pulled it to him; the hatch opened wide ... Then they saw one another -- the first time since they had left earth. Aleksey Leonov beckoned to Tom Stafford, who glided toward the hatch, and Leonov glided out of the Soyuz ... their hands met.

How we have all waited for this first handshake ...

111-551

The first telegram transmitted by telex to our Press Center:

The sixteen thousand-man Oblast SSO of Tataria, representatives of ten cities, Oblast and union republics working on the all-union shock-work Komsomol construction projects of KamAZ and Nizhnekamsk, congratulate the crew of the world's first international space station. We wish for you successful work in orbit and a safe return to earth. We hereby announce that instead of twenty-four million rubles we have pledged to do one million more rubles worth of work. We will deposit thirty-five thousand rubles into the construction fund of the city of Gagarin. On behalf of the members of the SSO of Tataria, Detachment Commander Vladimir Sokolov and Commissar Vladimir Nikolayev.

London

A telephone call from London. Pavel Mikhalev reports:

We watched the historic "handshake in space" on television together with James Aldridge, winner of the International Linen Peace Prize. Quite naturally, a journalist's first question is addressed to him.

"Impression? I'm convinced that this will never be forgotten. It is undoubtedly a historic event in space exploration. For me, the handshake in space during the year of the thirtieth anniversary of victory in Europe is like a continuation of the wartime allied friendship, a cosmic echo of the handshake on the Elbe. It is a meaningful and encouraging event for all peace loving people on earth.

"As a writer I cannot help being delighted by the bravery and strong will of these genuine men -- the cosmonauts of the Soyuz and the Apollo."

A Telegram

The Moscow City Headquarters of student construction detachments, on behalf of the members of the twenty thousand-man student detachment of the capital city, send greetings to the participants in the joint Soyuz-Apollo flight.

We express our warm congratulations to the Soviet cosmonauts and American astronauts in connection with their successful docking and joint work aboard the spaceships Soyuz and Apollo. We are amazed by the bravery of these bold space explorers, and we await their safe return to earth. We are observing "space watch" with record results in labor on the construction projects of our capital city.

258-13-39

Questions:

"How old can you be and still join the cosmonauts? How much can you weigh?"

"Do they need anybody to taste-test space food?"

"I think everything will be all right. What do you think?"

"Well, Leonov and Kubasov fixed their television very quickly. Do they know how to fix television sets at home?"

"I would never fly around the earth -- too many people have done that. But I would fly to Mars. Can it be done?"

"I have written upon entitled 'Docking.' It's not a very long one ... almost all of it fits in a single notebook ... Shall I send it to you?"

"Do you have any idea what the cosmonauts had in their suitcases when they walked up the ramp?"

"I should like to know where they put the garbage on-board the spaceships?"

Telex

Congratulations on the successful docking in space! We are proud of the Soviet cosmonauts! (Communications workers of Bukovina).

258-13-39

A woman's voice without a name briskly asks:

"Will you please tell me whether the effect of weightlessness on alcohol is being investigated?

"You see, under the influence of alcohol people frequently have a feeling of weightlessness ....

"No, no -- that's not what I meant. You seen, as time goes on more and more people will be going into space, and they will stay longer and longer times. They will have to observe birthdays and New Years ... now do you understand?"

Moscow

This little book, published by the Malysh Publishing House, is enormously popular -- and not only among those for whom it is directly intended. At the news stand of the Moscow Press Center it is being bought up by journalists just as fast as "Zavtrak kosmonavta" [A Cosmonaut's Breakfast] EPAS cigarettes. The author of the book is Aleksey Leonov.

Aleksey Leonov says: "I am a cosmonaut pilot. My name is Aleksey Leonov. Aboard the spaceship Voskhod-2 I flew along with Pavel Ivanovich Belyayev, and I took a walk in space.

"In this book you will find my drawings, which I made specially for you."

Houston

Yaroslav Golovanov and Anatoliy Manakov continue their report:

The world's first international space flight has taken place. The central event of the EPAS is completed. Here is how it is evaluated by different people that we met here in Houston:

A. F. Dobrynin, Soviet Ambassador to the United States:

"I am delighted and excited by what has happened. This is a major contribution by the scientists and engineers of both countries toward Soviet-American cooperation, an outstanding milestone on the road toward improved relationships between the USSR and the United States."

Glenn Lanni, technical director of the American segment of the EPAS program:

"That which has taken place speaks for itself. I confess that there was a time when I was rather critical of the EPAS: we and our Soviet colleagues were separated not only by language but also by different technical principles that had developed over the course of many years. But we were frank about it; we searched for common solutions and, when necessary, made compromises. During that time we all became rather skilled in diplomacy. And today this has yielded its fruits."

Those are the words of a specialist. But what do ordinary Americans think about the docking in space -- people who have nothing to do with space?

Not far from our hotel there is a shop known as Pirate's Market. It is difficult to refrain from going in there -- all the moreso if you believe the sign which says that among the variety of antique knicknacks the shop is selling "personal effects of Abraham Lincoln."

The mistress of the "market" is surprised: Oh, guests from the Soviet Union! This is quite an honor for me, especially these days! I saw everything on T.V. It's remarkable! I wish for our boys a successful flight together. Yes, indeed, now they are all 'our' boys ... "

Jess Furnish, a sheriff from the city of Indianapolis, Indiana:

"Thirty years ago Russian and Americans met on the Elbe as victors. Unfortunately, soon after that meeting the 'coldwar' began. But today they announced that there had been a second 'meeting on the Elbe.' This time it symbolizes the end of the 'coldwar.' When you witness such events it takes your breath away. Will you please convey from me and my children my heartfelt congratulations to your cosmonauts."

Sheremet'yevo

Soon after the Pan-American Airlines Boeing-707 jet landed at Sheremet'yevo, our correspondent Yuriy Golyshev had an interview with the aircraft's commander Mr. Evans.

"I believe that the joint efforts of the crews of the Soviet and American ships will serve to better relationships between our countries and to promote the progress of science and technology," said the American pilot.

And Aeroflot IL-62 is getting ready to head from Moscow to America.

On the ramp is the crew commander D. S. Demin:

"I have a great sense of pride for our science and technology. It is the best testimony of our successes, this handshake in space."

Bonn

Our correspondent in West Germany Genrikh Gurkov reports:

In commentaries by the West German press, special mention is being made of the fact that during the joint Soyuz and Apollo flight in space two experiments will be carried out which were worked out by West German scientists. The first, proposed by Professor Hanning of the Max Planck Biochemistry Institute, is known as "electrophoresis." His purpose is to get new data about the separation of healthy biological cells from diseased ones under the conditions of weightlessness. The second experiment

was prepared by Professor Buecker of Frankfurt University. It involves a special program for investigating the cells of vegetable and animal organisms in space.

Moscow

Our correspondent at the International Press Center Nikolay Orekhov transmits all his material at the same time, with the punctuality of a well-tuned chronometer. Here is his latest report:

Even in their serious articles, journalists love to insert a few interesting "tidbits." Flight officials know about this weakness of the representatives of the press, and they meet them half way. Yesterday during the morning press conference, the shift supervisor at the Flight Control Center V. Kravets reported that the first handshake in space by A. Leonov and T. Stafford took place at exactly 22 hours 19 minutes and 27 seconds Moscow time.

Contact with the cosmonauts at that moment was in the hands of Georgiy Shonin. At the time when the last hatch separating the cosmonauts of the two countries was suppose to be opened, T. Stafford was lingering in the docking module; A. Leonov couldn't restrain himself, and in the Flight Control Center we heard the Russian phrase: "Well hurry up, Tom, come on in!"

258-13-39

A telephone call to the press center. Very briskly:

"How are things there? All right? Did chey sleep okay? Please convey my warm congratulations."

Another phone call:

"One thing I don't understand: How do they heat their food there? After all, there is no air circulation in weightlessness, and without circulation a flame cannot heat ... "

The Press

Late in the evening there was a press conference for journalists accredited to the Moscow and Houston Press Centers.

Naturally, each one of the one thousand journalists covering the flight wanted to ask his own question. To answer everyone of them, the crews of the Soyuz and the Apollo would have to fly several weeks in space. It was resolved this way: The journalists selected a committee to determine which questions to ask the spacemen. In Houston the committee included seven people -- among them, a representative from PRAVDA.

In Moscow there were five persons, among them journalists from YAVESTYA and KOMSOMOL'SKAYA PRAVDA. These committees had to have several conferences before they settled on the questions to transmit over the airwaves. A single principle prevailed: The question had to be of interest to every agency of the press in any country of the world. (Report from the KOMSOMOL'SKAYA PRAVDA Press Center by V. Gudarev and L. Repin).

19 July 1975. A Day of Reunion and Parting.

TASS Bulletin.

Moscow Flight Control Center, 19 July. (TASS) Today at 9 hours 40 minutes Moscow time the fifth working day began for Aleksey Leonov and Valeriy Kubasov on board the Soyuz-19.

During the first radio contact the ship's commander A. Leonov reported that the cosmonauts had slept deeply and felt fine after resting.

At 13 hours the Soyuz-19 completed its sixty-third orbit around the earth, including twenty-seven while docked together with the American ship Apollo. According to data from telemetric information and reports by the crew, the on-board systems of the Soyuz-19 are functioning normally. The parameters of the micro-climate and the descent capsule and the orbital module are within the following ranges: pressure -- 512 millimeters mercury column; temperature -- 20 degrees Celsius.

Today's program calls for a continuation of the scientific and technical experiments on the joint flight with the Apollo.

Houston, Flight Control Center, 19 July (Special TASS Correspondent).

After the rest period this morning, the Apollo crew began to prepare for the undocking with the Soviet spaceship Soyuz-19 and for carrying out the "Artifical Solar Eclipse" experiment.

T. Stafford, V. Brand, and D. Slayton executed the orientation maneuver and inquired of the Soyuz crew about their readiness to undock. Having received confirmation from the Soyuz, the American astronauts removed the clamps of the docking device from coupling and radioed their Soviet colleagues about their final readiness to undock.

A spring-loaded push rod insured the separation of the ships. After the undocking the Apollo astronauts switched on the engines of the jet control system. The "Artifical Solar Eclipse experiment began

The American astronauts photographed the Soviet spaceship. Later, by means of the photographs made by the American crew, scientists will be able to determine the extent of shading of the Soyuz. From on board

the Apollo the crew had an excellent view of the night side of the earth and the dark sky, and against its background the silhouette of the Soyuz. When the distance between the two spaceships reached approximately 220 meters, the crew of the Apollo switched on the braking engines in order to return to the Soyuz for purposes of executing a second docking. This time the docking assembly of the Soyuz was in the "active" position.

At 15 hours 40 minutes Moscow time the following radiogram came through: "Docking completed."

The American and Soviet ships renewed their joint flight in a docked position.

The first international space flight in the history of mankind is continuing successfully.

By 13 hours on 19 July the Soyuz-19 had completed sixty-three orbits around the earth, including twenty-seven hours docked together with the American Apollo.

During the second half of the working day the crews of the Soyuz-19 and the Apollo prepared the ships for undocking. For the purpose, the pressure in the Soyuz-19 was raised to the level that is customary for independent flight on Soviet spaceships. Aleksey Leonov and Valeriy Kubasov put on their spacesuits and passed from the orbital module into the descent capsule. In accordance with the program, at 15 hours and 2 minutes the Soviet and American spaceships would be undocking and moving away from each other.

During the separation from the ships a joint scientific experiment known as "Artifical Solar Eclipse" was carried out. During the experiment, on board the Soviet ship they made a series of photographs of the Artificial Solar Eclipse which took place as a result of the placement of the Apollo between the sun and the Soyuz-19. This for the first time realize the possibility of an experimental verification of a radically new proceedure for investigating the sun's corona and properties of the environment directly surrounding a spaceship.

On completion of the experiment, cosmonauts Aleksey Leonov and Valeriy Kubasov made a movie of the Apollo. Then they put their docking assembly into active mode and executed the turns and orientation of the Soyuz-19 necessary for a second docking.

At 15 hours 40 minutes the second docking with the American ship took place. This confirmed the Soviet and American designer's and technician's decisions in the development of the new docking system making it possible to allow either of two spaceships to perform the active docking role.

The final undocking of the Soviet and American spaceships took place at 18 hours 26 minutes, marking the beginning of the stage of joint experiments during separate flight.

In the time remaining before landing, the Soviet cosmonauts will observe and photograph individual sections of the earth's surface for purposes of the national economy and will carry out a number of scientific experiments and prepare the ship for descent. The landing of the Soyuz-19 will take place on 21 July on at 13 hours 51 minutes Moscow time within Kazakhstan.

Aleksey Leonov and Valeriy Kubasov feel fine. All systems of the Soyuz-19 are functioning normally. The flight of the manned spaceships Soyuz-19 and Apollo continues.

Man Made Eclipse.

Special PRAVDA Correspondents Report from the Soviet Flight Control Center.

The day of 18 July was truly a day of exchange visits for the inhabitants of the international orbital complex. On the Soyuz and the Apollo, as the saying goes, the "doors were always open" -- three times the cosmonauts passed from one segment of the complex to the other in order to carry out joint experiments. Their performance on that difficult and busy day received high marks from both technical directors of the flight -- G. Lanni and K. Bushuyev.

An interesting detail: To commemorate the meeting in space, the Soviet and American crews exchanged souvenir medals, which were "docked together" beforehand by the cosmonauts. Two halves of medals depicting the Soyuz were taken into orbit by A. Leonov and V. Kubasov. The two other halves, depicting the Apollo, were delivered to the "assembly point" by the American astronauts. These unique souvenirs were made in the Moscow suburb of Mytishchi in a plant that manufactures experimental and souvenir items. The designer was artist K. D. Khrenkov, the plant's director.

But now we see on the television screens that the crew members have floated through the long passage tunnel for the last time. The closed hatches seemed to place a period at the end of this stage of the flight. And at the same time the operation constitutes the start of the next cycle of operations.

In any voyage around the earth there are orbits which, like milestones, mark the space path of the ships. For the Soyuz and the Apollo it was the thirty-sixth orbit, when the two emissaries from different continents became a single orbital complex. The milestone orbit this time is the

sixty-fifth, when docking occurred.

The new androgynous-peripheral docking system, in the general opinion of the specialists, proved itself very well in linking the two ships together. Nevertheless, in order to make the final judgment it is necessary to watch how it will perform during the disconnecting of the spacecraft. Thus, the undocking maneuver is itself a vital technical experiment. But the organizers of the flight complicated the task.

From space comes the word: Leonov and Kubasov have put on their space-suits and moved into the descent capsule. The undocking has begun. The ships slowly float away from one another. The Apollo at that time has been oriented so that it will move exactly toward the sun. The Soyuz crew begins to take pictures of the Apollo as it moves away. Incidentally, the main object of the pictures is not the ship but rather the sun. Or, more accurately, the sun's corona.

The fact is that during the first undocking the cosmonauts are still simulating a very rare celestial event -- a solar eclipse. The role of the artificial moon is played by the Apollo. When it is at a distance of about 220 meters from the Soyuz its angular dimensions will be twice as large as the visible disc of the sun. And Leonov and Kubasov get an excellent opportunity to record on film the sun's corona without any kind of interference from earth's atmosphere.

Naturally, scientists on earth are anxiously awaiting the results of the experiment. After all, full solar eclipses at one spot on our planet happen only once every three hundred years. Throughout the history of instrumental observations, people have had the opportunity to observe eclipses for only a total of about two hours. Now, several minutes are added to this.

During the interval, Leonov and Kubasov with their equipment are literally glued to the porthole of the hatch of the docking assembly of the Soyuz. They are recording on film not only the sun's corona but also the microatmosphere around the Apollo. In the vacuum of space, the ship's surface releases a steady stream of particles of gas, water, and other volatile substances and motes of dust. These change the physical characteristics of the surrounding environment and, consequently, may affect the readings on the ship's instruments and introduce error into the scientific data. Because of this it is understandable that it is very important to determine the nature of the "atmosphere" around the ship.

Everyone who saw the docking of the Soyuz and the Apollo on television will likely long remember that impressive sight. It is natural that photographs of it were printed in newspapers all over the world. Now again the ships slowly come together in space. After the Artificial Solar Eclipse a second docking is underway, known as the test docking.

This time the role of the active ship will be played by the Soyuz. The reason that it is necessary to thoroughly test the docking assembly.

And so the ships are again docked together and the cosmonauts have another chance to have dinner. After that, the two "earthly stars" again appear separately above our horizon -- the final undocking has taken place. But this does not all mean that joint operations are concluded. The Soyuz and the Apollo are continuing interact with one another for scientific purposes. Signals in the ultra-violet range are being sent from the American ship to the corner reflector of the Soyuz and returned to the Apollo. This will make it possible to determine the concentration of atomic oxygen and nitrogen at the flight's altitude.

... The ships of the two countries move farther and farther apart from each other in space. But the work which they performed in orbit has surely brought the planet's peoples together. And this can be considered the main result of the international flight. Yu. Apenchenko, A. Pokrovskiy.

"Happy Landing!"

Special PRAVDA Correspondent Reports from Houston.

Yesterday we took part in an unusual press conference. We asked our questions on earth. The answers came from space. First the journalists accredited to Moscow asked the questions. Then we asked them from Houston. Millions of Americans heard our questions and answers by television.

After the press conference I talked to several people at the Houston Space Center. To my question as to what made the greatest impression on them, the people answered as follows:

"A feeling of respect, a feeling of friendship which the Soviet and American cosmonauts have for each other."

"The wish to continue cooperation, expressed by the cosmonauts of the two countries."

"Valeriy Kubasov's hope that the children of the world would never know the horrors of war."

"The HOUSTON POST had this to say about the press conference: "The chief message that we received from the Soviet and American cosmonauts can be formulated as follows: 'If we can work shoulder to shoulder in outer space, why can't we achieve the same cooperation on earth?'"

And the famous commentator Walter Cronkite summarizing the results of the day, began his broadcast of the latest news with the following words:

"The Soyuz and Apollo have already completed their main task. The two Russian cosmonauts and the three American astronauts together with scientists, engineers, and technicians from the two countries proved that the Soviet Union and the United States of America can cooperate to achieve peaceful goals in the interest of all mankind."

Here at the Space Center, this cooperation can be seen everywhere these days. Directors of the American center are in constant contact with the Soviet center. The flight director on the American side Pete Frank is always exchanging information with his Soviet colleague A. Yeliseyev. The technical director on the United States side Glenn Lanni told journalists yesterday:

" The interaction between the centers is excellent. Several times every day I have been talking by telephone to my friend and colleague Konstantin Bushuyev. We work so well together that we can understand each other almost instaneously."

Astronaut Eugene Cernan, who is working at the Space Center, knows the Soviet cosmonauts very well; he met them in Moscow and in Houston, hosted them at his home and visted them in Zvezdny; he has worked with them a great deal during training sessions.

Cernan says today: "These are remarkable fellows. We can do miracles working with them. I have come to like them and am proud of the fact that they consider me their friend."

... Now as I transmit this correspondence, the crews of the Soyuz and the Apollo are preparing to undock. They have already carried out the joint scientific experiments, the results of which are of great importance to world science. It is not surprising that at the Space Center you can meet representatives of many American Universities and Scientific Centers. B. Strel'nikov.

Report from New York.

America Applauds and Reflects.

"We can already say that the main role of the joint Apollo-Soyuz flight has been achieved. Three Americans and two Soviet cosmonauts have not only docked their ships brilliantly: they have also shown that our two countries can work together even under the special conditions of space." These words were pronounced last night by Walter Cronkite, a newscaster for CBS a large television network. Cronkite was saying what was on the minds of millions of his countrymen.

Going into raptures is not in style these days in the local media which is inclined to be skeptical. This is especially true when it applies to the Soviet Union or even cooperation with it. Evidently, then, this makes all the more remarkable the following words, extracted recently from leading American newspapers: "In addition to whatever meaning this has for concerns of relaxation, the historic American-Soviet docking in space is the kind of step forward which helps to make future space flights safer" (CHRISTIAN SCIENCE MONITOR). "A miraculous and unforgettable achievement, which does credit to the technological prowess of both countries and all the astronauts and scientists involved in this fantastic accomplishment" (NEW YORK TIMES). "Even those who are on the whole indifferent to space exploration cannot fail to be excited by the mission ... Some may object to the priority of space research, but not many will undertake to dispute the fact that future actions have to be jointly undertaken. The Apollo-Soyuz flight demonstrates the bravery of the five men in space capsules and the technical preparations and organizational expertise of a whole legion of those who remained on earth. Naturally, all Americans together with all Russians are hoping for the safe return of the cosmonauts" (WASHINGTON POST).

These days will take their deserved place in the history of space research. For all Americans glued to their television sets, they will remain in the memory also as a time of important earth discoveries. The people of this country know very little about the actual life of the Soviet people: why this is calls for special discussion. In four days of space contact the people have found out more about us, apparently, than in years..

When from an altitude of more than 200 kilometers Valeriy Kubasov yesterday arranged a tour of the Soviet Union via television -- the Black Sea, Urals, and the Volga -- at least ten million Americans took part in that unique tour. When the Soviet and American astronauts held the first press conference in space yesterday, the same ten million were asking questions of them together with the correspondents. When the television screens showed Svetlana Leonova, a school teacher, and Lyudmila Kubasova, an aviation engineer, the Americans saw not just loving wives who were concealing their nervousness with slightly embarrassed smiles, but they were also seeing educated, intellectual women who were at the same time elegant; this was very important for understanding our way of life.

Like us, Americans honor their cosmonauts. Understandably they have acquired a respect for our cosmonauts -- because of their bravery, resourcefulness, and high professionalism. It is harder to explain the cause of the unusual affection which surrounds the names of our cosmonauts in the United States. Can it be the fact that the reserved Kubasov and the outgoing Leonov, about whom the Americans know that when he was leaving his wife said "Try to be a little more serious, at least for the television cameras," and that when it is required he can be more than serious --

that these two astronauts so to speak complement one another? Can it be that fact that the Americans see in these two cosmonauts one, sincere people? Whatever the reason, Leonov and Kubasov, as they are, are a revelation to America, and the space Odyssey thus takes on an additional dimension.

Local publications have printed the refreshing drawing by artist Leonov: Brand, Slayton, and Stafford are astride the Apollo: they have a cowboy lasso in their hands, and are gazing into interstellar space: "Where are they?" After the docking of the two ships the drawing was obselete, but people like it so much, that it stays on.

It may be that most gratified of all is Dr. Thomas Payne -- one of those who were at the source of this space episode. Now, Vice-President of General Electric, at the end of the 1960's he took over the post of main administrator of NASA and he was involved in the organization of the landing on the moon. In autumn of 1969 Dr. Payne held the first negotiations about a joint flight with the President of the Academy of Sciences USSR M. Keldysh.

What are the feelings now of this eminent American scientist and organizer; what does he think about the EPAS?

In his conversation with the YZVESTYA Correspondent he said: "I'm very happy -- all of our hopes have come true. But I am more excited about the future than the past. It seems to me that at a certain stage the Soviet and American space programs can merge and lay the ground-work for an extremely broad and multi-faceted cooperation. The Soviet Union has achieved enormous success in the construction of space stations. Incidentally, we are keeping in mind the fact that not just one but at the same time two Soviet ships are now circling the earth -- the Soyuz and the Salyut. It seems to me entirely likely in the near future the experience of our countries will be combined to create transport facilities and build space laboratories. It may be that I am more aware than other people of the extraordinary complexity of the technology of modern space flights and I do not see any other way to explore space than by combining efforts.

"It is easy enough to talk about all this now. But when we first began to work on the program of the flight of Soviet and American spaceships, many people did not believe in such cooperation and did not want it. But even then I believed that when all of the advantages of such cooperation became known both in terms of engineering and science, reason would come to prevail. I do not doubt that the success of the Soviet-American cooperation in the field of space exploration is directly relevant to the future of mankind." V. Kobysh, YZVESTYA Correspondent.

The Flight in the Mirror of the World Press.

A Good Example of Cooperation.

> The continuing flight of the Soyuz-19 and Apollo spaceships, the operations executed in orbit by Soviet and American crews, and their contacts with earth are bringing about an endless flood of responses from all continents of the world. These responses emphasize the importance of this event, which opens a new era in the history of space exploration -- not only for science but also for the process of further relaxation of tensions in the world, a strengthening of the spirit of mutual understanding and cooperation.

The General Secretary of the Communist Party of the United States Gus Hall expressed the opinion that "the flight and docking of the Soyuz and Apollo in space represents an embodiment of the basic hopes and aspirations of mankind -- peace and progress. The fact that the joint space expedition has become possible," said Gus Hall, "speaks in favor of the fact that peace and progress are also possible through the combined efforts of all of the people on earth, workers and scientists. The world is viewing the flight of the Soyuz and Apollo spaceships and their meeting in space as proof of the fact that efforts directed at achieving relaxation of tension and peaceful co-existence among nations having different social-economic systems are possible, essential, and mutually beneficial. This historic flight opens up a new era."

The Deputy Chairman of the Council of Ministers of Poland K. Olszewski declared: "History will define two events this year as turning points in the eternal striving of mankind for a happy life -- the upcoming third and concluding stage of the Conference on security and cooperation, and the joint flight of the Soyuz and Apollo spaceships. This space experiment could not have taken place without the favorable changes in the international situation, and it would be difficult to find a more eloquent symbol of the upcoming conference than this joint flight. Essentially these two events involve just one thing: a departure from the demonstration of force and confrontation and approach to a policy of cooperation and mutual interaction ...

"The Soyuz-Apollo flight is one form of making a reality of the ideas of peaceful co-existence and peace among nations; this is the cornerstone of the policy of the parties and governments of the countries of the socialist commonwealth."

The Soyuz-Apollo scientific experiment has gone outside the earth's atmosphere. Its significance also goes beyond the bounds of the two great countries: it has become an event of world importance. These are the words of the Czechoslovak newspaper RUDE PRAVO.

It is difficult to over estimate the importance of this flight, for which there is no equal in the history of cosmonautics.

RUDE PRAVO quotes the words of the greeting sent by General Secretary of the CCCPSU L.I. Brezhnev to the Soyuz and Apollo crews dealing with the fact that the relaxation of tension and the positive advances in Soviet-American relationships have created the necessary conditions for carrying out the first international space flight. The newspaper comments that broad possibilities are being opened up for the development of cooperation between countries having different social structures.

The Hungarian newspaper NEPSZAZ declares: The meeting of the Soviet and American cosmonauts is not just a triumph of technology of the twentieth century but also of the policy which with increasing clarity testifies to the necessity of extending ties between the nations. We will remember the hour when the meeting in space took place.

The chairman of the Chamber of Deputies of the Italian Parliament A. Petrini said: "I should like to see the feeling of friendship and cooperation that has been demonstrated in the joint flight of the spaceships extended and strengthened not only between the Soviet and American peoples but also between all of the nations of earth."

The veteran French journalist Genevieve Tabui [transliteration] declared: The joint Soyuz-Apollo Soviet-American space experiment is an event of great international importance. It symbolizes a new turning point toward relaxation, an improved political climate on our planet. The successful docking in space and the handshake between the commanders of the Soviet and American crews amke it possible to see even more clearly the benefit that can be provided to mankind by cooperation between different countries, by combining their efforts in the development of science and technology.

The West German Weekly VORWAERTS emphasizes: Born during the era of international relaxation of tension, the Soyuz-Apollo space experiment embodies a striving toward peaceful cooperation. Commenting on the great possibilities for expanding ties between the USSR and the United States in the field of science and technology, the weekly newspaper concludes that "both sides have extracted benefits from this experiment."

The president of the influential Japanese organization Soka Gakkai, D. Ikeda, declared that the Soviet-American space experiment showed the people of the world the importance of mutual trust and cooperation. He expressed the hope that the Soviet-American joint experiment in the field of space exploration would make a contribution toward realizing the hopes of all mankind -- establishing a firm peace throughout the world.

Indian's permanent ambassador to the United Nations R. Jaipal said: The scientific feat of the Soviet cosmonauts and the American astronauts responds to the highest aspirations of mankind, primarily in the interests of peace throughout the world.

The PAKISTAN TIMES writes: The joint Soviet-American experiment will provide favorable prospects not only for the further development of relationships between the two countries but also for improving the general atmosphere throughout the world. The example of the successful Soviet-American cooperation in space can become a stimulis for effective international cooperation in other spheres as well. Pakistan, like other countries of the Third World, welcomes such joint experiments. (TASS).

Chronicle of the Day. Reports from the KOMSOMOL'SKAYA PRAVDA EPAS Press Center.

The Press

A prominent place in American newspapers is being given to the world's first "press conference in space," which took place late in the evening of 18 July. The newspapers are publishing photographs of the commanders of the Soviet and American crews. In a dispatch from Houston the WASHINGTON POST writes:

"The three American astronauts and the two Soviet cosmonauts demonstrated good will again today, carrying out a joint press conference in space, carrying out three joint experiments, and telling television watchers in the United States and the Soviet Union about their ships."

The NEW YORK DAILY NEWS writes: "During the press conference in outer space the members of the Soyuz and Apollo crews made a joint appeal for peace throughout the world and greeted the new era in international cooperation signaled by their flight." The NEW YORK TIMES singled out the words of Aleksey Leonov to the affect that this operation had become possible in an atmosphere of relaxed tension, that it represents an important step on the endless quest of space research through the joint efforts of all mankind."

The French newspaper LE FIGARO writes: "The Soyuz-Apollo experiment has evoked a warm response throughout the world. Millions of television watchers were able to observe the historic handshake in space."

Souvenir

The TASS correspondent reports details about the medals that the cosmonauts exchanged.

The cosmonauts "assembled" these medals beforehand. Two halves of a medal bearing the likeness of the state flag of the USSR on the one side and a likeness of the Soyuz ship on the other side were taken into orbit by

Leonov and Kubasov. Two other halves of the medal -- showing the flag of the United States and the Apollo -- were carried on board by the American astronauts.

These medals were made at the Mytishchi Experimental and Souvenir Items Plant. An interesting detail is this: The technical papers accompanying the souvenir medal indicate that the plant guarantees the "assembly" of the medals by hand for the members of the Soyuz and Apollo crews.

Soyuz-Apollo

During the fourth exchange visit between the Soyuz-19 and the Apollo, Thomas Stafford stayed in the Soviet ship while Valeriy Kubasov stayed in the American ship. The hatches between the ships were closed 8 minutes later than the schedule called for. This was reported in the Moscow Press Center by the shift flight director V. D. Blagov.

A Telegram

Congratulations to the International crew! Good health to you! I'll be expecting you for tea. I will bake a cake. V. Yastrebova. Lyubertsy.

Bochum

Our correspondent in West Germany Genrikh Gurkov reports:

From many kilometers away you can see the gigantic silver globe which looks like a spaceship from science fiction films. The globe, "approaching the earth" on the outskirts of the Ruhr City of Bochum, has nothing to do with science fiction; it does relate directly to actual space research. Underneath its plastic exterior is a 20-meter reflector -- a parabolic antenna directed into space.

"By invitation of the director of the Bochum Observatory, the director of the Institute Space Research Professor Heinz Kaminski, I spent the day with him and his colleagues. The apparatus was receiving direct information from space. We could see and hear everything that was being transmitted from the Apollo and Soyuz spaceships -- the joking banter of Leonov and Stafford before the docking and during the historic handshake, also the businesslike conversations between the cosmonauts and the ground-based centers, the unforgettable moment when the Soyuz appeared in the porthole of the Apollo and began to approach ...

"Professor Kaminski did not conceal his excitement:

"And 'this outstanding experiment,' the scientist told me, 'opens a new phase in the history of manned flights into space. I believe that it is on par with such great events as the flight of Yuriy Gagrin, Aleksey Leonov's space walk, and Neil Armstrong's first steps on the moon.'"

Belgrad

The crew of the Soyuz-Apollo space station has been invited to the capital city of Yugoslavia.

An international exposition will deal with the achievements of mankind in space exploration. It will open in early September.

Visitors to the exposition will be able to look at markups of the manned ships, also interplanetary and orbital stations. Quite naturally, the "main exhibit" will be markup of the Soyuz-Apollo international space station.

Soyuz-Apollo

At the same time that the spaceships were beginning their execution of the second docking, the members of the standby crew for the Soyuz A.V. Filipchenko and N.N. Rukavishnikov came to the Moscow Press Center. They had stood watch for 2 1/2 days at Baykonur -- until the successful docking of the Soviet and American ships. Now they are taking part in the supervision of the flight.

"Look how calmly and smoothly the ships are gliding above the planet, how calmly all of this looks on the screen," commented N. N. Rukavishnikov on what had taken place. "It is difficult to believe that their velocity with respect to the earth is 28,000 kilometers per hour. I can well imagine how busily both crews are working at this moment, how attentively they are watching their instruments: the most critical moment is now coming."

A Telegram

To Aleksey Leonov and Valeriy Kubasov.

We warmly and sincerely congratulate you on the successful beginning of the historic flight. It is especailly gratifying and pleasant that the flight is being participated in by the cosmonaut-welder, an honorary scientific member of our institute, Valeriy Nikolayevih Kubasov, who was the first in the world to carry out the experiment of smelting and welding metals in space. We wish you and your American colleagues great success in carrying out the scientific program. Have a good flight and a safe return to Mother Earth. Komsomol Organization of Electric Welding imeni Ye. O. Patona.

New York

John Glenn -- the first American cosmonaut to fly around the earth onboard a space ship in February 1962 said:

"I am very happy about the cooperation of the American and Soviet cosmonauts. In addition to its purely scientific significance, the joint flight of the Apollo and the Soyuz is playing an important role in strengthening the process of relaxation of tension throughout the world."

Havana

Aleksandr Karmen, our correspondent in Havana, reports:

"A report which appeared recently in the morning edition of the San Salvador newspaper DIARIO DE HOY made many people's hearts flutter.

The headlines were in large type: "Native of San Salvador in Joint Space Flight of Russia and the United States." The text below read: "Astronaut Vance Brand, who is taking part in the first joint space flight of Russians and Americans was born in San Salvador in 1941. He is the son of Julio Ernesto Brand Nunez, a worker in the General Treasury and Cristalina Brand ... " Later on the article cited various facts from his biography and at the end expressed good wishes for a successful completion of the flight program. Any final doubts among skeptics were supposed to be dispelled by a printing of the astronaut's photograph.

Nevertheless, more skeptical reporters decided to inquire at NASA. There they were politely informed that the astronaut, first of all, was born ten years earlier than his San Salvador "double" and, in the second place, he was not born in San Salvador.

The flustered and embarrassed Julio Ernesto Brand was himself unable to confirm the version given in the DIARIO DE HOY. It is true that he did not deny that some facts in the biography of his own son could serve as grounds for such a sensational story. As it turned out, his son also worked on Cape Canaveral and at the Space Center in Houston. And, what is most surprising, outwardly he does resemble Vance Brand. For corroboration the old man right then phoned his son in Los Angeles, where the boy calmly lives with his family, giving no thought to the space odyssey. Eye witnesses say that the telephone shook with laughter.

A Telegram

Dear Cosmonauts Aleksey Arkhipovich and Valeriy Nikolayevich! We, members of the Komsomol-Youth Collectives of Kirovskaya Oblast, winners of competition for the right to sign a report to your space crew, warmly congratulate you on the successful beginning of history's first joint flight involving cosmonauts from the USSR and the United States. It is a great honor for us to report to you about our achievements in labor, learning, and sports; we pledge here, on earth, to work in a Stakhanovite manner, in a Communist manner. We wish you a good flight and a successful completion of the planned program.

London

Our own correspondent Pavel Mikhalev reports to the Press Center as follows:

The newspaper of the British Communist Party MORNING STAR under a first column headline "Brezhnev and Ford Welcome New Era in Cooperation" publishes a separate editorial in which it remarks that the joint flight serves as a manifestation of increasingly stronger peaceful international cooperation between the two countries."

Moscow

Nikolay Orekhov has reported from the Moscow Press Center as follows:

The flight directors are doing everything possible to make the work of the journalists easier. Yesterday the representatives of the press were given the opportunity to pay back part of their debt 'not by words but by deeds.'

"At one of the briefings it was mentioned that the operation of a television center in Halifax (Canada) was interfering with communications between the cosmonauts and the Soviet tracking ship located on the Atlantic. Evidently this report was instantaneously transmitted by correspondents to Halifax, and notification was made.

"During the next meeting with the journalists, the shift flight director Blagov announced that the interference had been completely discontinued; he thanked the Canadian television company for its willingness to cooperate to ensure the success of EPAS."

Houston

Special correspondents Yaroslav Golovanov and Anatoliy Manakov report:

"The space museum is located in the same building and in the same spacious room where journalists are working who have come here from all over the world. To the right of our desk are the Americans; the the left are TASS correspondents; behind us are the Japanese; in front of us is a correspondent from the GDR. They are writing, pounding their typewriters, yelling into the telephones, listening to the radio, watching television, reading press bulletins, and drinking orange juice which is furnished free by Bill Barklou [transliteration], a representative of a citrus company in Florida. "Since our Space Port is located in Florida, Florida must take part in the Soviet-American flight, if only with this juice!" (Reports from the KOMOSMOL'SKAYA PRAVDA Press Center by V. Gubarev and L. Repin).

20 July 1975. A Day of Diverging.

TASS Bulletin.

Moscow Flight Control Center, 20 July. (TASS). The flight of the Soyuz-19 spaceship is approaching its conclusion.

Aleksey Leonov and Valeriy Kubasov began their sixth working day in orbit at 9 hours 10 minutes Moscow time.

At 10 hours 55 minutes they held routine communications with the Soviet Flight Control Center. At the end of the communication, the commander of the ship carried out the current stage of the "Growth of Micro-Organisms" experiment, while the flight engineer continued the "Zoneforming Fungi" experiment.

At 11 hours 45 minutes the cosmonauts set about executing ship's maneuvers simulating preparations for descent.

The parameters of the orbit in which the Soyuz-19 spaceship is concluding the flight are as follows:

--maximum distance from earth's surface: 219 kilometers;

--minimum distance from earth's surface: 216 kilometers;

--rotation period: 88.8 minutes;

--orbital inclination: 51.78 degrees.

According to telemetric data, the parameters of the microclimate in the compartments of the ship are as follows:

--pressure: 750 millimeters mercury column;

temperature: 20 Celsius.

The condition of cosmonauts Aleksey Leonov and Valeriy Kubasov is excellent.

All systems of the Soyuz-1^ spaceship are functioning normally.

Moscow Flight Control Center, 20 July. (TASS). The Crew of the Soyuz-19 Spaceship is Continuing to Execute the Planned Flight Program.

The cosmonauts have executed maneuvers which simulate the operation of preparations for descent, with switch-on of the braking engine unit. During the execution of the maneuvers, the ship's commander manually oriented the ship toward earth and then transferred it into the mode of automatic orientation and stabilization before switching on the corrective engine unit. In order to ensure that the paramenters of the ship's orbit

changed only slightly as the result of the operations, the braking engine unit was switched on for just a short time.

All of the ship's systems and the braking engine unit functioned normally during the checking maneuver.

During the routine television report, the cosmonauts answered questions sent in by television viewers.

From 15 hours 30 minutes to 16 hours 18 minutes the crew carried out the experiment known as "Photographing the Sunset." The purpose of it was to measure the optical properties of the atmosphere and atmospheric absorption of the sun's light. During the experiment the rising sun was photographed.

Later on the crew carried out the concluding portion of the biology experiments known as "Embryonic Development of Fish" and "Growth of Micro-Organisms."

According to telemetric data and reports by the crew, all systems of the ship are functioning normally and the condition of the cosmonauts is excellent.

Houston, Flight Control Center, 20 July. (Special TASS Correspondent). After the undocking with the Soviet Soyuz-19 spaceship, the American Apollo resumed independent flight.

On 19 July T. Stafford, V. Brand, and D. Slayton undertook the carrying out of scientific research within the framework of the joint Soyuz-Apollo program, also a number of independent scientific experiments. For purposes of carrying out the joint experiment known as "Ultra-Violet Absorption," the Apollo made a fly-by of the Soyuz at a distance of several hundred meters. They also took photographs of the Soviet ship. The report to the Houston Flight Control Center was that the quality of the photographs was excellent. However, according to a spokesman for the Center, the data obtained during the first stage of the experiment did not confirm the hopes placed on it. At the request of the American astronauts the Soyuz was turned by 180 degrees in order to continue the experiment by means of the corner reflector installed on the instrument unit compartment of the Soyuz. The new measurements completely satisfied the scientists.

At about 23 hours Moscow time the Apollo executed the departure maneuver in order to avoid colliding with the Soyuz during the next segment of the flight.

Within the framework of the joint program the Apollo crew also carried out some biology experiments: "Microb Exchange," designed to explore the effect of space flight conditions on man's immunity system, and the

"Zone-Forming Fungi," designed to study the effect of space flight conditions on the process of the formation of daily rings in the ray fungus. Work on the experimental system of the Universal Electric Furnace was continued. The Apollo crew made observations of the earth and photographed its surface.

At 4 hours 50 minutes in the morning Moscow time on 20 July the astronauts began their rest period.

Summarizing the results of the day, the flight director on the American side Pete Frank stated at a press conference that it was a very interesting day. Everything that we intended to accomplish together with the Soviet crew was accomplished, he said. The results justified our hopes. Pete Frank mentioned that the flight was proceeding normally and that he was maintaining constant communications with the Soviet Flight Control Center.

Houston, Flight Control Center, 20 July. (Special TASS Correspondent). It was announced in the Flight Control Center that after sleeping the crew of the American spaceship Apollo resumed carrying out scientific experiments. Astronauts T. Stafford, V. Brand, and D. Slayton are making observations of the earth and photographing individual parts of it; they are also conducting experiments in the study of ultra-violet radiation.

The flight is proceeding normally, according to the planned program.

Just Before Landing.

Special PRAVDA Correspondents report from the Soviet Flight Control Center.

During communications with the cosmonauts, every second counts; for that reason many abbreviations are used. Concerning experiments they say: "AS." this means that the experiment is a joint one, carried by the Apollo (A) and the Soyuz (S) together. Or consider the command: ("Execute S-1,) that is, the experiment is being carried out on the Soyuz alone; the digit stands for the complete designation of the operation. So that instead of saying: "We are executing the independent experiment 'Growth of Micro-Organisms' in the Biokat," the cosmonauts simply report: "We have started S-1."

The day of the Soyuz-19 flight after its separation from the Apollo is taken up by several biology experiments. None of them are being carried out for the first time (during the voyage of the Soyuz-16 they developed a procedure for experiments and obtained valuable results); nevertheless, the interest among the scientists has not diminished but has rather increased. In space, the boundary between the terms "for the first time"

and "not for the first time" is as yet rather arbitrary. Naturally, you have to start somewhere. Naturally, however, science cannot risk drawing conclusions on basis of a single experiment. In this regard, biologists -- just like astronomers, physicians, and engineers -- never tire of repeating this statement: "We need statistics. We need as much information as possible in order to draw definite conclusions."

Here is what Aleksandr L'vovich Mashinskiy, one of the supervisors of the biology program, has to say on the "Growth of Micro-Organisms" experiment:

"Twice every day the cosmonauts inspect the development of the ordinary proteus it is distinguished by its mobility of forms, and the color boundary of the growth can be easily observed. At the same time, a given temperature is maintained in the instrument -- it must not deviate more than by 1/2 of a degree either way. During the flight of Anatoliy Filipchenko and Nikolay Rukavishnikov we noticed an increase in the growth rate of the micro-organisms. There were changes in their appearance and the surface area they covered; the electron microscope showed also a change in the ultra structure of the cells of the proteus. Could that be a random fact or else the effect of factors in the flight? We have to check, we have to be certain of the reliability of the data."

In experiments conducted jointly the reliability and the scientific value of the results so to speak double. Some of the materials will be brought back from the EPAS orbit by the American astronauts and delivered to biological laboratories in the United States for a thorough analysis and subsequent comparison of the results. The researchers are striving to make these experiments maximally "clean" to rule out the possibility of side effects. This requires, in particular, that a stable temperature be maintained in the biological capsules not only during the voyage but also immediately on their return from space. At the landing site of the Soyuz they will be immediately placed in a thermostatic container. The same kind of container, made in the Soviet Union, is on board the helicopter carrier "New Orleans," which is awaiting the splash-down of the Apollo near the Hawaiian Islands.

During the eighty-fourth orbit of the Soyuz flight the cosmonauts photographed the sunrise. These photographs will add to information about different layers of earth's atmosphere; this is important for meteorologists and optical sciences.

The voyage of the Soyuz-19 is coming to a close. Aleksey Leonov and Valeriy Kubasov have transferred their materials and instruments to the reentry capsule of the ship; they are to be returned to earth. Once more they have checked operation of the systems that are functioning during the descent segment. The panels of the solar batteries are oriented toward the sun. More than 120 hours have elapsed since the launch.

The familiar, smiling faces appear on the screen in the main room of the Control Center. This is the last television report; from now on communications will be maintained by radio.

"All of the planned experiments have been completed; we are getting ready to return to earth. Tomorrow we will switch on the braking engine and in 45 minutes we will be back home. See you back on earth!" say the cosmonauts.

And, one more message of good wishes. To their comrades the crew of the Salyut-4 -- Petr Klimuk and Vitaliy Sevast'yanov:

"We wish for you, dear friends, a successful completion of your lengthy and crucial work in space."

On the evening before the day of the landing of the Soyuz-19 we asked Academician Boris Nikolayevich Petrov to give a general and, of course, preliminary evaluation of the work that had been done. Here is what the scientist said:

"First of all, the compatible approach and docking devices passed their test with flying colors in orbit; checking of these was one of the main purposes of the flight. We can already say that the efforts of the designers of this equipment -- Soviet and American specialists who have spent years of intensive labor to prepare for this voyage -- have been successful. The very complicated system of control and communication is also functioning impeccably. As a control specialist I should like to emphasize this especially. This is the first time in the world that the efforts of two Flight Control Centers have been combined and a great variety of technical devices have been used in a single complex -- ground-based measurement stations, ships, and satellites -- on such a large scale. I personally was especially amazed at the press conference. While it was in process the ships were flying more than 14,000 kilometers; the questions came from two continents separated by oceans. And yet the feeling was as if we were all in one room.

"I should like to mention three aspects. First of all, the scientific-technical one. The EPAS experiment even before its completion can be considered a contribution to world cosmonautics. Second of all, the experiments included in the flight's program, are in the mainstream of scientific development. And in the third place -- perhaps this is the most important -- there is the human and political significance of the event. It manifested the dialectic of life. The joint Soyuz and Apollo flight became possible in an atmosphere of political relaxation. And in turn we are convinced that EPAS will serve the great task of strengthening cooperation between nations." Yu. Apenchenko, A. Pokrovskiy.

And Ships Can Help One Another.

Special IZVESTYA Correspondent. Bronislav Kiltovoy reports from Houston.

The joint flight of the Soyuz and the Apollo spaceships is nearing its end. In the Houston Press Center the typewriters are once more clattering loudly. From the room where the television network correspondents are located you can hear lengthy monologues: they are recording their broadcasts.

Here in this room I have been noticing a man who is clearly no journalist, but he has been following with great interests the events unfolding on the television screen. This venerable man, wearing glasses, with a trim little Mexican-style moustache, is Paul Campbell, a consultant in aviation and space medicine from San Diego.

My conversation with him, naturally, began with the Soyuz and the Apollo.

Campbell said: "I was especially interested in watching this historic international experiment in orbit. Before our eyes one of the most crucial means of rescuing people in space was checked out for the first time -- and, I might add, very successfully. I refer to the androgynous docking assembly which makes it possible if necessary to link-up with a space ship that has had an accident and rescue the crew from its prison in space. Such a situation, if you recall, was anticipated at one time by our writer Martin Keydin in his book 'Lost in Orbit.'

"For me personally," continued Campbell, "to the highest degree the humanitarian meaning of this Soviet-American flight is especially dear. The fact is that over the past ten years I have been much involved in the problem of rescuing crews in space. Since 1965 the International Astronautics Academy, of which I am a member, has had operating a special group involved in the problems of rescuing people in orbit. When I was younger I was chairman of that group. Specialists from thirty-four countries of the world are taking part in its work, including, of course, the Soviet Union and the United States.

"Long ago, long before negotiations began about the EPAS program, we were thinking about the problems the solution to which the whole world saw on television screens these past few days. But ten years ago, don't forget, to many people these seemed dreams of fantasy. And even then we were discussing the problem of how to make different atmospheres and spaceships compatible -- assure oxygen and ordinary earth atmosphere. We were searching for the most convenient methods of having crews speaking different languages work together; we tried to imagine how best to organize communications between flight control centers and different countries, between search and rescue services in the event of an emergency situation where the landing would take place far from the designated landing site.

"And even then Soviet scientists were taking very active part in the work of our group. I was always certain that the Soviet specialists would make a major contribution to international cooperation in space orbit. Your country can be proud of its scientists. It is a pleasure for me to remember meetings with corresponding member of the Academy of Sciences Oleg Gazenko, cosmonaut-physician Boris Yegorov and Professor Adamovich. I believe that an understanding of the high humanitarian meaning of these efforts will serve as a basis for brilliant cooperation among specialists of many countries in researching problems of rescue missions in space.

"I know that in Japan a group of volunteers are working out a way to make rational use of fishing boats such as are almost always found on the ocean for purposes of rescuing the crews of spaceships. The Swedes are involved in problems of rescue missions in the Arctic, and in Switzerland there are specialists who are working out ways to help crews that have become lost in the mountains. So far, fortunately, none of these things have been needed. But the first operation with respect to rescue in space has already been carried out. You recall the first Apollo-13 in flight, when the explosion of an oxygen tank on board the ship threatened the crew's safe return to earth. Let us hope that such occurrences will not take place, but preparations for them are nevertheless essential."

Here in the Control Center everyone is recalling with pleasure those busy days when the cosmonauts and astronauts were working together -- first in different orbits and then in a single complex -- the Soyuz-Apollo.

Space Metallurgy.

Special KRASNAYA ZVEZDA Correspondent reports from Houston.

Space is essential to everyone. This is no longer just a slogan or motto. Today it is an established fact, a working formula. Outside of the earth's atmosphere it is possible to carry out experiments and scientific-research work that are impossible under ordinary work conditions. The deep vacuum in space, weightlessness, radiation, sharp drops in temperature, and other factors and phenomena, are extremely interesting for science, and are available "free of charge and in unlimited quantity" in this natural laboratory.

As early as October 1969 the first technological experiments took place in earth orbit. This refers to the welding equipment Vulkan, which was installed on board the Soviet spaceship Soyuz-6 and was used by V. Kubasov to try out different methods of welding metals under conditions of vacuum and weightlessness.

The use of weightlessness is very attractive (and, of course, very promising) for the development of new metal and semiconductor materials consisting of elements characterized by substantially different specific weights, by means of crystallizing them from a liquid state. Under earth conditions the devlopment of such compounds is impossible or else extremely difficult.

Weightlessness "presents" us with crystals of semiconductor materials, which will represent the latest word in instrument building, radio electronic industry, and the manufacture of electronic computers. We will be able to produce little spheres of ideal shape for different kinds of bearings. The processing of chemically and biologically active industrial raw materials, work with powder materials, the study and utilization of new metalurgical processes, the production of so called "fothed steel" (light as cork, and strong as cast metal), the production of glass of ideal purity and precision so vital for optical science -- all of these are the "gifts" of weightlessness. And it is no accident that on board the Soyuz-Apollo space complex they are carrying out interesting experiments relating to determining the effect of weightlessness on a number or metalurgical and crystal chemistry processes in metal and semiconductor materials.

The experiments were proposed by the American side and combined under the overall designation "Universal Furnace." The scientific program of these investigations was worked out in the Institute of Metallurgy Academy of Sciences USSR. The experiment is supervised by A. Boyz [transliteration] a staff member of the Marshall Space Center.

The Soviet and American specialists that are now working at the Houston Space Center have talked about some details of this experimentation. Thus, for example, aluminum with little spheres of tungsten embedded in it was placed in the "furnace" under the effect of a temperature above 1,000 degrees these components should form a new alloy with a predetermined structure. And yet these elements have substantially different specific weights.

Another experiment involves the formation of monocrystalls in space. This is a very promising direction in technology. A. Leonov and V. Kubasov took on board the Soyuz samples of germanium and silicon. The latter constitutes two percent by weight. The scientists expect that as a result of fusion the silicon will spread evenly throughout all of the germanium. Thus, a liquid smelt will produce a monocrystall.

The supervisor of the Soviet part of the experiment is Professor L. Ivanov of the Academy of Sciences USSR.

And so, the "Universal Furnace," smelting in space, tests, and research ... It is as yet difficult to predict in every detail how "space technology" will develop in the future. It may be that after research work has been done, earthlings will build laboratories and shops in space, factories and mills for the production of unique parts and materials, for large-scale scientific experiments, and for testing ... The Soyuz and Apollo flight provides excellent confirmation of this possibility. Engineers Colonel M. Rrebrov.

On the Road Back.

Report from the Moscow Press Center.

In the Moscow Press Center we are use to meeting regularly with people who are most often merely written about and who only rarely appear on radio and television. It is difficult to imagine the work of the journalists covering the Soyuz-Apollo experiment without meaningful conversations with three SRP [shift flight directors] from the Soviet Union: V. Blegov, V. Kravets, and S. Tsybin. These are very experienced and authoritative experts in their job. And the correspondents have managed to determine that in addition they are very clever in their words and very resourceful. They have been getting lots of questions at press conferences and later on in the corridors ...

It is easy to see why, on Sunday, having completed his last shift for the flight, V. Blegov answered this question "And what will you do now?" as follows, smiling: "I will try to get some rest from all these correspondents."

V. Blegov's colleague -- V. Kravets, the director of the second shift -- yesterday observed his fortieth birthday. Involved in his job, he almost forgot about this rather important milestone, but his comrades reminded him. At his post Kravets found a bouquet of carnations. Everyone signed their names on a map of the world which the birthday boy uses, and one of his colleagues had written a humorous poem of congratulations, which runs approximately as follows:

> We are not burning with excitement
> Just because EPAS is nearing its end.
> Please accept today our congratulations
> Our SRP -- Vadim Kravets.

Since the Houston and Moscow Control Centers are working in unison, birthday greetings were also sent to Moscow from Houston from the entire second shift or, as they call it in Houston, "silver shift." Our cosmonauts spend all of Sunday getting ready for the descent to earth. They rehearsed all the maneuvers necessary for the operation; these went normally, and so the cosmonauts began to pack their things. Talking with journalists, V. Blegov said the Soyuz-19 was suppose to complete the landing at 13 hours 51 minutes Moscow time near Arkalyk. The parachute system would go into operation at an altitude of 10 kilometers above the earth's surface. Helicopters and a search group would be waiting for the cosmonauts there.

It was easy to tell from the conversations between earth and Soyuz-19, relayed simultaneously to the Press Center, that the Moscow Flight Control Center was having the cosmonauts pay special attention on the packing of their things.

Then A. Leonov and V. Kubasov were able to take a small break from their work. A. Leonov asked the Moscow Center whether they had contact with the Apollo -- evidently, the Soyuz-19 crew already missed their American colleagues in space.

During one of the radio contacts with Soyuz-19, which took place via the scientific-research ship Kosmonavt "Yuri Gagarin" operating in the northern part of the Atlantic Ocean, A. Leonov and V. Kubasov were able to talk with their friends on the orbital station Salyut. P. Klimuk and V. Sevast'yanov had already completed their 900th orbit around earth.

Every hour we are informed about the weather conditions at the site of the upcoming landing of the descent vehicle of the Soyuz-19.
A. Krivopalov.

The Flight in the Mirror of the World Press.

For the Good of all Mankind.

The Fourth Period of the Space Age. Improving the Safety of Spaceship Crews. Innovative Solutions. Cosmonauts Ready for Any Emergencies.

PRAVDA, Bratislava

In the future, when historians refer to our days, they will have to emphasize that in this space age, the beginning of which was started by the launch of the first manmade satellite and the legendary flight of Yuriy Gagarin, the EPAS is a turning point which opens up the era of the "industrial" conquest of space on the basis of peaceful cooperation among nations. It is as a result of this flight that the fourth period of the space age has begun.

What was Characteristic of the Three Preceding Periods?

The first period was, unquestionably, man's flight into space on board ships having automatic control. The second period was flights into space by crews of cosmonauts on board ships having independent control. The third was characterized by flights of orbital stations, the crew of one of which -- Petr Klimuk and Vitaliy Sevast'yanov -- is now in space.

The EPAS program is among actions of the greatest humanism of our age. A no less important feature of it is the concretization and realization of the possibilities of cooperation between countries having different social structures on the principles of peaceful co-existence.

The Soviet Union has advocated cooperation in space on an international level since even before the orbital launch of the first man made earth satellite. At the same time, however, the ice of the "coldwar" was too

strong. The United States didn't even want to hear about it. But in the long run the United States drew a conclusion that such cooperation was necessary.

In 1970 the whole world was astounded by the dramatic epic of the Apollo-13 flight, which was compelled by serious malfunctions to return from lunar orbit. Everyone agonized over the cosmonauts, because by that time mankind had already paid for revealing the secrets of the universe with the lives of some of its best sons.

Because of the rising number of flights into space, where much is still unknown, the possibility of unexpected accidents has remained an actual danger. In the past, if some accident happened aboard a space vehicle and Soviet and American spaceships were also in orbit at the time, the crew of the ship that was not in danger could only watch the tragedy of its partner sympathetically. Even with an overwhelming desire to help the stricken crew, they could do nothing. Help was impossible because of completely different technology, particularly of the docking assemblies, as well as the difference in atmosphere and atmospheric pressure in the American versus the Soviet spaceships and, of course, in orbital stations.

An important step toward eliminating these shortcomings was the conclusion of an agreement between the Soviet Union and the United States concerning cooperation in the exploration and utilization of outer space for peaceful purposes, signed in Moscow on 24 May 1972. The agreement, in particular, stipulates agreement between the two countries concerning the development of compatible devices for docking and rendezvous of ships of the Soyuz and Apollo types in earth orbit and the passage of crew members from one spaceship into the other.

The very fact that two spaceships from different countries can dock in orbit and that this only recently "supersecret" sphere of research is being violated by cosmonauts through mutual exchange visits during which they carry out numerous joint scientific-research and technical experiments -- all of this constitutes an important step in the development of international cooperation on the only possible grounds: the principles of peaceful co-existence. Scientists, engineers, and many scientific and political observers and commentators emphasize that the development of joint facilities for the rendezvous and docking of spaceships representing two different systems will not only help to improve the safety of crews on manned spaceships but also serve as a stimulus for peaceful cooperation.

International cooperation in space is the key to many problems. This can be manifested, for example, in the organization of an international weather forecasting service, geological exploration, research into the field of environmental protection, and other international undertakings which will yield maximum benefits only if a global approach is taken. The possibility of docking ships and exchange visits by crews from ship to ship will make it easier for all mankind to solve problems relating not only to our planet but also to the entire solar system in the future.

During the two-day joint flight within the framework of the EPAS, the cosmonauts aboard the hermetically linked Soyuz and Apollo ships are to test the components of the overall system of rendezvous on earth orbit both in automatic and independent mode; the operation of the androgynous docking assembly will be checked, also the technology for the exchange visits between cosmonauts and astronauts from ship to ship. The flight will become an important source of accumulated experience for further joint expeditions of spaceships, including the rendering of urgent help in the event of any emergency situation.

To become a reality, the EPAS required enormous expenditures and the creative energy of scientists, engineers, technicans, and workers. This relates not only to the innovative treatment of the androgynous docking assembly, which makes it possible for each of the docking ships to play the role of the active vehicle. The new docking mechanism will be mounted on all space vehicles in the future: spaceships, rocket planes, and so on.

It is also possible to trace the element of innovative labor and cooperation clearly in the design of the docking tunnel, which eliminates the worry about the danger of cosmonauts getting "the bends" and makes it possible for crews to transfer from ships in which the atmosphere differs from from one another both in makeup and in pressure.

During this age we have frequently witnessed how newspapers, television, and radio have at particular times united tens and hundreds of millions of people throughout the world. And right now reports from space and ground-based flight control centers by radio and by television, also newspaper articles, are making all of us participants in the fantastic flight into space, the flight into the Twenty-First Century.

The Planet Applauds.

The Bulgarian newspaper RABOTNICHESKO DELO writes that the remarkable event in space is justifiably attracting the attention of millions of people and is evoking delight all over the planet. "Indeed," emphasizes the newspaper, "consider the efforts and accuracy necessary to prepare for and accomplish the rendezvous of the two spaceships in the boundless ocean of the sky. This fact clearly and convincingly shows what can be achieved by human genius when efforts are directed at useful cooperation, when they serve the good of mankind."

The Hungarian newspaper NEPSZABADSAG emphasizes that this important event goes far beyond the bounds of technology. The Soviet-American experiment is of enormous importance in terms of foreign policy, opening up great prospects for the process of further relaxation of Soviet-American relationships, relationships between the east and the west.

"The five Soviet and American cosmonauts will soon return to earth, enriched with heretofore unprecedented experience and a sense of strengthened friendship," writes the French newspaper L'HUMANITE. "They will return with proofs of the value and necessity of scientific cooperation. Their flight is also an invaluable testimony of the fruits which peaceful co-existence can yield."

"Undoubtedly the Soviet-American rendezvous in space is a great event," writes the newspaper of the German Communist Party UNSERE ZEIT. "The fact that the USSR and the United States, having radically different social structures and possessing the world's most powerful scientific and industrial potentials, are combining their efforts for purposes of the peaceful exploration of space, is not only of scientific but also of immense political importance."

The Soyuz-Apollo project is a concrete implementation of the policy of cooperation on an international scale, says the Belgian Weekly SOIR ILLUSTRE. The newspaper ECHO DE LA BOURSE emphasizes that the joint Soviet-American experiment in space testifies to the fact that "there is an ongoing improvement on earth in the relationships between countries having different social-economic systems."

"The friendly relations that have developed between the crews of the countries, their simple, human words calling for peace and relaxation of tension, have produced a great impression on all who watched the gripping television broadcasts from space," writes the Italian PAESE SERA. The newspaper MESSAGGIERO views as "superlative" the execution of the operations involved in the undocking and second docking of the spaceships, and the newspaper remarks on the "outstanding technical features of the Soviet ship Soyuz-19, which passed all tests."

The Swedish press views the Soviet-American space experiment as a major political and scientific-technical event in world history. The newspaper SVENSKA DAGBLADET writes: "This flight has laid the groundwork for a space era." The great scientific value of the joint Soyuz-Apollo flight is emphasized by the newspaper NORDSJONSFLAMMAN.

"The meeting in space by the crews of the Soviet and American spaceships lays the grourdwork for a new era in cooperation between the two countries," writes the SUDAN newspaper AS-SAHAFA. "The joint flight of the Soyuz-19 and the Apollo ships represents a brilliant proof of the fact that a major step forward has been made in relationships between the Soviet Union and the United States."

"The whole world joyfully and with satisfaction welcomes the space rendezvous of the Soyuz and the Apollo. On Madagascar people are watching

this historic experiment with bated breath, seeing in it a symbol of international relaxation," reports the Madagascar Press Agency. (TASS).

21 July 1975.

The Day of Return.

TASS Bulletins.

On 21 July 1975, after completing the joint Soyuz-Apollo program, the Soyuz-19 with its crew consisting of Commander Hero of the Soviet Union USSR Cosmonaut-Pilot Colonel Aleksey Arkhipovich Leonov and Flight Engineer Hero of the Soviet Union USSR Cosmonaut-Pilot Candidate of Technical Sciences Valeriy Nikolayevich Kubasov returned to the Soviet homeland.

The flight of the American ship Apollo will continue until 25 July on its own program.

The reentry vehicle of the Soyuz-19 completed a soft landing at 13 hours 51 minutes Moscow time in the designated area of the Soviet Union and 54 kilometers northeast of the town of Arkalyk. The descent of the Soyuz-19 by parachute and its landing were reported by a color television.

The condition of the cosmonauts A. A. Leonov and V. N. Kubasov is excellent.

The flight program of the manned spaceships Soyuz-19 with respect to the joint Soviet-American Soyuz-Apollo project has been completed. During the six-day orbital flight of the Soyuz-19 ship, the following operations were completed: compatible rendezvous and docking devices were experimentally tested for the first time; the docking of the Soviet and American spaceships was carried out, also exchange visits by the cosmonauts moving from one ship to another, and joint scientific-research experiments including "Artifical Solar Eclipse," "Ultra-Violet Absorption," "Zone-Forming Fungi," "Microb Exchange," and "Universal Furnance." These investigations are of great scientific and practical importance.

During independent flight the crew of the Soyuz-19 carried out biology and geophysics experiments and observations; they photographed certain portions of the earth's surface for the interests of the national economy.

During the flight the Soviet and American cosmonauts demonstrated outstanding cooperation and mutual understanding; they carried out their assignments harmoniously and precisely, in a genuinely friendly atmosphere.

The control of the joint flight of the Soyuz-19 and the Apollo spaceships was exercised via tracking stations by the Soviet and American control centers, which were in constant direct television, telephone, and telegraph contact.

Throughout the experiment specialists of both of the Flight Control Centers worked together very well.

The successful completion of the joint experimental flight of the Soyuz-19 and the Apollo spaceships has confirmed the correctness of the technical solutions adopted in the development of compatible docking systems, making it possible to carry out joint flight by two differently-designed ships built by the USSR and the United States. The scientific-technical results of the experiment represent a substantial contribution to the storehouse of world cosmonautics, science, and culture. The experience accumulated by the Soviet and American sides during preparations and implementation of the joint experiment will serve as a good basis for the future development of international manned space flights and joint scientific research in outer space.

The joint flight of the Soyuz-19 and the Apollo spaceships represents an important step in the development of international cooperation in space. In this flight, the peoples of the world can see an actual softening of international tension, toward the relaxation of which the Soviet Union is making a large contribution. General Secretary of the CCCPSU Comrade L. I. Brezhnev has said: "... From space our planet looks even more beautiful, although not very large. It is large enough so that we can live on it in peace, but it is too small to subject to threat of nuclear war." The strengthened mutual understanding and good will between peoples constitute a guarantee of a stable peace on earth.

Houston, Flight Control Center, 21 July (Special TASS Correspondent). The American spaceship Apollo carrying astronauts T. Stafford, V. Brand, and D. Slayton on board continues its independent flight.

The astronauts are busy in carrying out independent programs of scientific research. T. Stafford, V. Brand, and D. Slayton yesterday conducted an experiment known as "Extreme Ultra-Violet Radiation." Its purpose is to search for the sources of ultra-violet radiation such as some stars of large magnitude, planetary nebula, red giants, and dwarf stars, and so on.

Among other astronomy investigations being carried out by the crew is the experiment known as "Helium Luminousness." It calls for studying the parameters of the temperatures and the distribution of velocity and direction of movement of the interstellar space and the vicinity of the solar system.

Observations and photographing of the earth's surface have continued for purposes of studying natural resources. Regions were photographed in Africa, Europe, South America, and Australia.

Observations have been carried out on little fish taken on board the ship to study the effect of weightlessness. An experiment has been carried out with the Universal Electric Furnace.

The schedule for executing the scientific experiments is at the present moment somewhat disrupted, although by the end of the flight the crew hopes to make up for lost time. The astronauts feel fine.

After an eight-hour rest period the astronauts are continuing today their experiments in the field of astronomy, biology, and medicine.

At today's press conference in the Houston Flight Control Center one of the supervisors of the joint flight on the American side, D. Paddi [transliteration], reported the successful landing of the Soyuz-19 ship.

D. Paddi remarked that the American specialists are very satisfied with the successful conclusion of the Soviet part of the joint Soyuz-Apollo program.

A Brilliant Finish.

Special IZVESTYA Correspondent Boris Konovalov reports from the Soviet Flight Control Center.

The parachute is dropping toward earth. The reentry vehicle of the already legendary Soyuz-19 is swaying softly on its straps. The final minutes of the historic voyage, history's first international manned flight. The Apollo is still in space, but Aleskey Leonov and Valeriy Kubasov will soon return joyfully to earth.

The Soyuz-19 finally departed from the Apollo on Saturday, 19 July. But for a long time yet -- almost three orbits -- the ships flew side by side conducting a joint scientific experiment. But gradually the map of the world in the main room of the control center showed the red dot of the Soyuz on the trajectory line of the flight beginning to move farther away from the blue dot representing the Apollo.

On Sunday evening Aleksey Leonov reported to earth: "The packing of the equipment to be returned is completed. All three containers have been sealed. We are getting ready to return the final documents."

Right after that he asked: "How's the weather in Moscow?"

"It has been an excellent day today, Aleksey," answered Georgiy Shonin. "Why, are you homesick?"

"Is today Sunday?"

"What do you think?" answers Shonin humorously.

There are no days off in orbit. From the very first to the very last minute this flight requires intensive and very crucial performance.

The cosmonauts are tired. Even for the burly Leonov, the electrocardiagram objectively shows fatigue. Incidentally, if electrocardiagrams were taken for the flight directors, for those who have sitting these days at the control panels in Moscow and Houston, undoubtedly the readings would not be too good. Naturally, everyone is excited. After all, this flight represents the finale of three years of intensive work on the part of Soviet and American specialists.

The cosmonauts have transferred into the reentry vehicle samples of the "Microb Exchange" experiment, containers with the "Zone-Forming Fungi," other objects of biological investigation, priceless films of photographs of history's first "Artificial Solar Eclipse," photographs and movies taken during the cosmonaut's and astronaut's exchange visits. The cosmonauts will bring with them as well as all of the souvenirs and gifts presented by their American colleagues.

On the morning of 21 July during the 95th orbit the cosmonauts once again put on their spacesuits; they themselves transferred for the last time into the reentry vehicle of the Soyuz-19 and began to prepare for descent.

"The orientation is accurate," reports Leonov when the ship enters the zone of radio visibility of the American tracking station on Ascension Island. "Everything is normal."

"I read you," answers the commander of the second back-up crew Yuriy Romanenko, who has been maintaining communications with Aleksey Leonov and Valeriy Kubasov during these hours.

The crew reports that the engine operated for the stipulated t. .

On the 96th orbit over the Atlantic Ocean in the vicinity of Ascension Island, red hot jets blasted silently from the engine nozzle of the Soyuz-19; the ship left space orbit and headed rapidly toward earth. In the landing area near the city of Arkalyk airplanes and helicopters of the search service are already waiting for the ship. Soyuz-19's altitude above the earth is now 217 kilometers, while it is now about 800 kilometers away from the Apollo. It is unlikely now that the American spaceship can see the Soyuz heading toward earth.

The modules have separated! In the sky over Central Africa in the approximate vicinity of the ancient city of Khartoum the blast cartridges have gone off, and the instrument and orbital modules of the Soyuz fly away from the reentry vehicle. Alas, the orbital module where the first "space reception" was held cannot be retained for history. It is fated to burn up when it enters the dense layers of the atmosphere. In space technology this rigid principle still holds: we only retain that which is vitally necessary for further operations.

"Everything on board is normal. The separation took place on time, and we are moving steadily," reports Leonov from the Soyuz. "We can hear your conversations among yourselves," says Romanenko.

"How come you are eaves dropping on us?" grumbles Kubasov.

"We are now flying over Africa. The land is sandy with some kind of lakes," reports Leonov. "The ship is flying smoothly. Turning on course. We can hear the operation of the little motors of the SUS [reentry control system].

The cosmonaut's condition is normal. Everything is fastened down. Everything is going fine.

Now the reentry vehicle is heading toward earth alone, enveloped by the flame due to the hurtling atmospheric resistance. Layers of heat-insulation protective coating are burning off and evaporating, not allowing any flame to penetrate. The radar stations have detected the plasma track of the ship. Increasingly closer to earth. The ship has already passed over the Caspian Sea.

"Everything is going fine. Our portholes have become smoky," the happy voice of Leonov breaks in.

"How do you feel?"

"Fine. Thank you."

Romanenko says: "You are 25 kilometers away from the designated landing point."

Now the braking parachute is to burst open, followed by the main parachute.

The report comes in that two helicopters can see the reentry vehicle.

The gigantic cupola of the parachute is carefully carrying to Mother Earth the planet's newest heroes. Aleksey Leonov and Valeriy Kubasov have carried out this flight brilliantly; in space they managed to correct a malfunction in the television system and bring to tens of millions of television viewers the joy of participating in the flight, the opportunity to see the historic space event with their own eyes.

The crew reports that everything is going normally. The heat shield has been jettisoned, revealing the soft landing engines, which will go into operation right close to the earth.

Applause breaks out in the control center. At 13 hours 44 minutes the television screens show the cupola of the parachute carrying the reentry vehicle. The altitude is 2,000 meters. The pilots of helicopters are accompanying the reentry vehicle to earth. There is conversation between the helicopters and the cosmonauts.

The television cameras reveal to us a splendid sight. The ship is slowly falling to earth, making it possible for everyone to admire it. Puffs of smoke rise under the ship. This means that the soft landing engines have gone on. The parachute has been jettisoned. The reentry vehicle is lying on its side. A helicopter speeds toward it. At 13 hours 52 minutes the first helicopter lands next to the ship. The search teams open the hatch of the reentry vehicle. They help the cosmonauts to get out of their straps. They help them to disconnect the spaceships from the on-board life-support system. Then, two minutes later, we can see Valeriy Kubasov on the screens. Applause again breaks out in the Control Center. Aleksey Leonov comes into view. They are surrounded by our colleague journalists. The first interviews back on Mother Earth.

Aleksey Leonov says: "Dear friends, the flight is completed. It was a difficult one. Very difficult. But now that we are back on earth, things are fine. We are quivering. We are quivering from joy, from fatigue, and from sleepless nights. It is very likely that during those days we slept a total of fifteen hours. Thank you for your support and your attention."

"We docked with the American ship, met with the American astronauts, and shook each others hands," says Valeriy Kubasov into the microphone. "Now, we are happy to be back on earth."

The cosmonauts climb into the helicopter. Then they head toward Arkalyk. After that they will be greeted at the Space Port of Baykonur.

On 25 July the reentry vehicle of the Apollo will complete its landing. The Soyuz-Apollo project will be over. The American astronauts will deliver to earth the flag of the United Nations, which was given to them in space by Leonov and Kubasov. It will be delivered to the United Nations -- after all, this flight belongs to all people of the earth. It was carried out for the sake of peace by our planet.

The Joy of Reunion.

Special IZVESTYA Correspondent Anatoliy Gershov Reports from the Soyuz-19 Landing Site.

The first international flight of the Soyuz and Apollo spaceships is over for the Soviet crew consisting of Commander A. Lenov and Flight Engineer V. Kubasov.

The center of the young Turgayskaya Oblast -- Arkalyk -- has become a space landing point; at one time or another other Soviet cosmonauts have landed there. The Soyuz-19 carrying cosmonauts A. Leonov and V. Kubasov has just landed near as yet small but rapidly growing city of the

steppes. It is with warm and heartfelt greetings that the dwellers of the steppes have met their glorious brothers from the stars, who have returned to Mother Earth after flying in the first international space voyage.

For cosmonauts A. Leonov and V. Kubasov, each day was scheduled literally down to the minute, and they had a maximum workload. But the final hours of their stay in space were doubly busy: the reentry is the concluding and most critical stage of the flight. The descent was successful. Here is how it came about.

Like a giant dragon fly our helicopter skims rapidly over the steppes. After the day's heat the steppe begins to cool off somewhat. Then the whitish haze just before evening the enormous copper disc of the sun hangs suspended above the horizon, and below stretches a vast, parched valley, the golden saucers of lakes, the delicate web of the little rivers of the steppes with wild thickets of reeds along their banks.

But, suddenly, clouds gather, a quick summer rain pours down, and everything suddenly becomes fresher. The steppe has become green everywhere, as if newly washed. In the sky, as if descended from among the clouds, we can see the orange parachute bringing down with it the reentry vehicle.

If it were not for the light cloud of dust kicked up by the reentry vehicle at the moment of landing and the frightened running herd of saigas not far away, it might appear that nothing special had taken place. That's how simple the descent was. In actuality, of course, everything is much more complicated. The work of all of the services involved in the accurate and timely descent was of the highest order.

And here is the landing site of the cosmonauts. A. Leonov and V. Kubasov have already come out of the descent vehicle. We can see the cosmonauts surrounded by doctors and friends.

Leonov says, smiling: "Everything is fine with us."

Because of different circumstances it is not always possible to see the cosmonauts this way at the first moment and to talk with them after their return from space. The journalists are all the more anxious to hear what Leonov and Kubasov have to say; they are interested in literally everything: how the entry was, which space menu was the favorite of the ship's crew, what the cosmonaut's first impressions were back on earth, and much else. A. Leonov and V. Kubasov answer these and other questions in detail and willingly. Both are looking lively, with perhaps just a little more excitement than usual. This is from joy, from the realization that they have done their duty, which required the complete involvement of all of their powers, considerable skill, and experience on the part of the cosmonauts.

The Soviet-American experimental flight of the Soyuz and Apollo ships lays the groundwork for future international orbital stations in space.

The reentry vehicle after landing tilted slightly to the side, but this did not hinder the cosmonauts in getting out of it without any special help. Smiling, Aleksey Leonov flamboyantly writes the following word on the side of the reentry vehicle: "Thanks!" This, according to statements by both cosmonauts, applies equally to the Soyuz-19 ship, which so excellently served its crew during the joint Soviet-American flight, and to those who were waiting and hoping, who provided the Soviet cosmonauts with a good, heartfelt reunion at the landing site. Right after the ship's commander, Valeriy Kubasov wrote his name. Then, unexpectedly, he smiled and handed me his ordinary piece of school chalk. And so I now have a fine souvenir of the flight.

At the city's airport, decorated in triumph, the people hold a celebration for the cosmonauts, who have expressed thanks to the party and the government for trusting them to take part in the first international space flight. Aleksey Leonov and Valeriy Kubasov are made honorary citizens of Arkalyk. Flowers, valuable gifts and souvenirs are presented to them.

A silvery IL-18 taxis up to the landing strip. A few more seconds, and it disappears among the light clouds drifting over the steppes this evening.

The Apollo Flight Continues.

Special TRUD Correspondents Report from Houston.

And so, Aleksey Leonov and Valeriy Kubasov are back on earth. The joint experiment was carried out brilliantly, but the American astronauts will remain in space for a few more days. The Houston Flight Control Center continues to work as it has been throughout all of these days. One of those people who left the Center only at night to go to bed was the technical consultant of the experiment on the American side Eugene Cernan, an astronaut who has been on the moon. He is a long-time friend with the Apollo Commander Thomas Stafford: they have flown in space twice together.

"Fortunately," says Cernan, "no special need arose for my advice, unless you count the matter of the stuck hatch and the unexpected hot smell in the docking module. But in both cases the problem was easily corrected."

In the past two years the astronaut has been to Moscow twice; he knows all of the cosmonauts and is on friendly terms with a good half of them.

Cernan continues: "Undoubtedly those two days -- or more accurately 44 hours -- that the Soyuz and Apollo were linked-up in a single space whole are very important. But I should like to point out that no less important were the preceding two years, when we were learning to work

together, when the Americans and Russians involved in the space programs were to speak 'getting adjusted' to one another. As you can see, this earthly 'docking' yielded outstanding benefits. Let us hope that our relationships -- I have in mind relationships in the broadest sense -- will continue to progress. We have unlimited scope for cooperative efforts."

And how was the Soyuz and Apollo flight from the standpoint of the medical men? We addressed this question to the main physician of the astronaut's team Arnold Nikogosian, who incidentally speaks Russian impeccably.

Doctor Nikogosian had this to say: " I was needed for consultation only once, when it was necessary to decide whether the astronauts had to put on oxygen masks before going into the docking module. There, as you know, they detected a smell that resulted from the overheating of a plastic part. Everything else was normal. The astronauts, like their younger Soviet partners, are in excellent shape. I would like to be as physically fit as Donald Slayton, who is fifty-one years old."

The main physician of the astronaut's team then touched on a problem which is interesting to many people: is there an upper age limit for flight in space? Doctor Nikogosian reminded us that during World War II people were serving as pilots who on physical grounds would not have been allowed to fly an airplane during World War I. Technical equipment is being protected, and ideas about the capabilities of the human organism are changing. The doctor expressed the opinion that when the time comes for commercial flights in space, on rocket plane, similar to present flights on passenger airlines, seventy-year old people may be flying -- even those who are not in ideal health.

In three days the Apollo will also head toward earth, aiming at a particular area of the Pacific Ocean. This area is located 170 nautical miles west of Barking Sands Island, which belongs to the Hawaiian archipelago. On 24 July the helicopter carrier "New Orleans" will be patrolling there, carrying eight aircraft and fourteen divers.

Meanwhile, the Apollo is still in flight. The astronauts are carrying out various experiments. Yesterday they performed the "Helium Luminescence" experiment in which they studied the parameters of temperature and the distribution of velocity and direction of movement of interstellar space in the vicinity of the solar system. In addition, the astronauts are making observations of earth and photographing particular sections.

Constant communications are being maintained with the Soviet Control Center. G. Protsenko, V. Sisnev.

Landing Completed!

Report From the Moscow Press Center.

Everything which has intensively involved the lives of everyone this past week in the Moscow Press Center, in covering the flight of the

EPAS Program, its excitements, sleepless nights, thousands of newspaper articles, and radio and television broadcasts -- all of this has focused on the high point of yesterday's events: direct relay of the moment of the descent of the crew of the Soyuz-19 spaceship. The culminating moment was when the reentry vehicle touched down on earth! The roar of applause, the happy smiles! And then a report was made about the final stages of the flight and the landing by the supervisor of the Soviet cosmonaut's training Lieutenant General V. Shatalov, S. Tsybin, the shift director of the Soviet Control Center who exercised control over the landing, and N. Gurovskiy, the chief of the Administration of Space Biology and Medicine of the Ministry of Health USSR. In conclusion they answered questions.

"Why was one parachute operating during the descent of the Soyuz-19?"

"There are two independent parachutes on the reentry vehicle. If the main one works, the second one is not needed."

"Will the Soyuz-19 crew be in contact with the American astronauts before splashdown?"

"Such contact is possible."

"What are the prospects for future Soviet-American cooperation in space?"

"The successful flight of the Soyuz and Apollo is brilliant example of the possibility of cooperation between the two countries in space exploration. Let us hope that this cooperation will develop." I. Melenevski (TRUD).

His Ships.

> Here is a story of about one of the ordinary spaceworkers -- Fitter-assembler Nikolay Dmitriyevich Shumilov we met him one time at the Space Port, and we met him again the day the Soyuz-19 landed.
>
> Here is what he said: "That's what our work is like."

Shumilov's uncle -- Ivan Stepanovich -- was by trade a cart driver. He rented a cellar room in the city. Everyone lived in one room: the uncle, his father and mother, his wife and four children, a brother-in-law, a brother of the brother-in-law, and nephew and nieces. Nikolay was the sixteenth. He came to the city for work, having spent three years in the village in the first grade -- there was no second grade. The year was 1929, and the First Five-Year Plan was in full swing. On the first Volunteer Saturday of his life, Nikolay was digging dirt where now the Gor'kiy Motor Vehicle Plant stands. He took up the fitter's trade

at Krasnoye Sormovo, and studied various skills: four hours of theory -- actually, reading and writing; four hours of practical work -- how to trim, cut, and bend iron. His irst ship was the self-propelled dry-cargo barge "Abkhaziya." The ship was built rapidly and well. The crew-leader received a prize -- a suit; Nikolay received a pair of pants ...

We had a talk before the launching of his latest ship. Another ship at another plant. Nikolay Dmitriyevich was circling a component with a screwdriver in his hands, stopping, examining, checking. He touched it carefully, as if petting it. His ship this time was the spaceship Soyuz.

"Nikolay Dmitriyevich, why do you keep worrying and checking? Consider how many eyes and how many hands have checked it already, have felt every particular detail ... "

"How can you say that? My signature heads the list; I am the first to answer for my work. This is no simple job. Take that refrigerator over there, a useful device. Or consider other equipment such as an automobile or an electric motor. all of these are important and essential, all made by clever hands. But even if something breaks for some reason, although its not good its not a disaster; it can be fixed. But not in this. There are no repair-shops as yet out in space. I have to answer not to the OTK [technical control section] but to people, and to myself. And consider this: I know my work best; I have every little screw memorized. So I have to look one more time, in conclusion,it is absolutely essential ..."

How do we define knowledge, skill, and expertise? They can hardly be confined within the narrow frameworks designated by the ordinary words "specialty," "qualifications," and "length of service." Consider Niloay Dmitriyevich. By specialty, a fitter-assembler; by qualification, top category; by length of service -- more than forty years. But to say merely this about him is to say pratically nothing. Why? Because behind these personnel data, which may coincide for many different people, stands the unique Nikolay Dmitriyevich, not just "one of them" but rather a character, and an individual, not just a fine expert but a talent. And a talent, as we know, is a rarity.

I ask: "How many different parts pass through your hands? Several thousand screws no doubt. And each one of them has its own place and purpose."

"Very likely. But you know, if I fit that screw there with my own hands one time, then you can show it to me later and ask me where it came from and I can answer."

"What is it, does it depend on the qualification level?"

"That too. But that's not all. My memory is ... well, a visual one. Once I see something I don't forget it."

Here, now that the conversation has turned to screws, it is essential to say one thing immediately. Assembly work is assembly work: you fit one part to another, fasten it properly where it goes, according to the calculations and blueprints. But it involves more than that. It involves creativity. More accurately, it becomes creative when the expert acquires the ability to look beyond the design conception and the blueprint of the assembly or unit and see the actual assembly or unit in action, in combination with others.

"Does it ever happen that you change a design?"

"Yes it does. After all, sometimes we can see more easily a simpler and better way to adapt some part. In such cases we go to the designers and make suggestions. They always pay attention to such suggestions. This has always been the custom, ever since Sergey Pavlovich Korolev."

"Weren't you working on the first ship, the one Gagarin flew in?"

"Yes I was. Up to that time the ships that were made were not manned. But in that case it was a matter of a man flying. We went all out. We worried. When they told about Gagarin on the radio, for those two hours while he was in space, consider it, we could not work. It was as if each one of us were flying."

"And do you remember when Gagarin first came into your shop?"

"Well you know ... " Nikolay Dmitriyevich is a little embarrassed. "Well you know, now everyone knows the name Gagarin, young and old. But at that time they were young fellows, cheerful, curious. We did not know them by name, and we also did not know who would be flying. To us they were all the same. No, to be honest about it, I do not personally recall Gagarin in the shop ... "

So this is kind of an awkard frankness. How could it be? He made the historic ship and he met and talked with those who came to work with him, but he does not recall Gagarin. Meanwhile, a curious notion is revealed behind this circumstance. Before the names Vostok and Gagarin flashed around the world, before the ship became historic, it had to be brought to the shop in the form of ideas, blueprints, and material, where it had to be assembled by parts and bolt by bolt. This assembly work was carried out by Nikolay Dmitriyevich and his comrades. And he presented the ship to the first pilot. He, like Gagarin, was thinking all the while about his work rather than history. Or, put it this way: they were not thinking about history -- they were making it: each doing his own job.

"It is a great happiness to love one's job" says he.

"Why do you love your job?"

It is difficult to answer such questions. Generally, everything boils down to the fact that it is pleasant, important, and essential. The

answer was so to speak programmed beforehand, yet the curiosity remains unsatisfied. After all, there are many interesting jobs. And which job is vital and important and which job is less so? Thus, brief answers frequently require more or less detailed remarks and commentaries. Here is an example:

"With my experience, my classification is high. They offered to make me a foreman, even a senior foreman. I told them, 'no, I don't want it.' Some people were surprised. They wondered what was wrong with me. After all, the job was the same but the pay was higher. But money doesn't mean much to me, we have enough. The main thing in a job for me ... " The search for the right word and finally he found it, putting it in its proper place, like a component part: "is myself! I want to work with my own hands, from start to finish. This requires an understanding of the soul. Do you know what happens sometimes? The work day comes to an end -- time to go home, sit by the television set. But you don't leave ... Someone comes up and says 'Why are you hanging around here Nikolay Dmitriyevich?' Why? My job needs me!"

For another example:

"People ask me 'How come you don't get a little plot for a garden? It's good for your leisure and it's interesting.' Sometimes I find it difficult to tell them that for me the most interesting plot is the one I have in the shop. I can't tear myself away from it. Now, when the time for retirement is approaching, sometimes I stop and think. Can it be I was wrong not to start a garden? But there is the land, the trees, ways of passing the time ... Anyway, I know that I cannot get along without the shop. Why is that? The ships we are building now, and the long distances our work is going -- it's hard to imagine. Why, they've even taken off into space together with the Americans."

It is hard to believe his age. It even seems strange to be sitting in front of a man whose labor has gone into each one -- each one! -- of our Five Years Plans.

"The Five Year Plans continue and we along with them," says he of himself and his comrades.

Many of those who work at his side are like sons to him. And in fact his own son works at the same plant as an engineer also his son's wife. He treats the younger workers with respect, like equals. He speaks about his comrades a great deal, willingly, and says good things. At no time have his descriptions and evaluations of their job qualities contained a hint of condescension.

"Our people are remarkable. Since 1962 our section has been designated a collective of Communist labor. And rightly so. I cannot recall time when anyone has said that they have been doing more work than they were suppose to. And yet sometimes the work requires more efforts. All of

them learn quickly, especially the young workers: from the tekhnikum and the institute. Well, school needs no special mention around here; the ten-year school is now the norm here. Excellent people. Sometimes I look at these young folks and think: why do they have to select cosmonauts specially? They're all equally fine."

And once more he thoughtfully repeats:

"The Five-Year Plans are continuing, and we along with them ... " (Yu. Apenchenko).

The Soviet People Speak.

Salute of Gagarin's Field.

The good news just arrived: The Soviet cosmonauts have returned to earth after the joint flight with the American ship Apollo! I am convinced that the friendly handshake in space by the Soviet and American conquerors of the world of the stars will have not only an important scientific but also a high political meaning.

This outstanding flight is close to us members of the kolkhoz imeni Shevchenko even more because of the fact that our farm on the bank of the Volga is the location of that famous field where on 12 April 1961 the world's first cosmonaut Yuriy Gagarin landed after his unparalleled flight in space. Now, in intensive work is underway on that same field. The harvest is underway. I myself and my comrades have already harvested one thousand or more quintals of grain apiece. With the red stars affixed to our combines we salute the successful completion of the space flight. V. Stepanov, combine operator of kolkhoz imeni Shevchenko, Engel'skiy Rayon. Saratovskaya Oblast.

Headed Toward Relaxation of Tension.

"The crew of the spaceship Soyuz-19 has successfully landed!" The good news spread with lightening speed throughout the shops of the Saratov Aviation Plant. Cosmonauts Aleksey Leonov and Valeriy Kubasov, having superbly carried out the complicated program of the flight, have returned to earth. The experiment was carried out with a fine degree of accuracy. The friendly meeting in space by the Soviet and American explorers testifies to the triumph of the peace-loving policy of our party and the Soviet state, who have adopted a permanent course of action headed toward the relaxation of international tension and improvements in Soviet-American relationships. A. Doronin, Fitter-Assembler.

An Astounding Event.

This event -- the friendly handshake of the Soviet and American cosmonauts -- is an astounding event. Also symbolic. We must have more such meetings

here on earth as well, so that the friendship and mutual understanding of the two nations can become stronger and more developed! K. Abdugulov, Chairman of the kolkhoz imeni Michurin, Hero of Socialist Labor.

The Flight in the Mirror of the World Press.

In the Name of Human Progress.

Washington. Two major countries of the world, combining their efforts, have successfully completed the joint experiment in exploration of outer space; this was confirmed by one of the directors of the joint flight on the American side -- D. Paddi. The successful completion of the Soyuz-Apollo program will help to improve Soviet-Americans relations and the development of cooperation between the two countries in other spheres, he added.

The Speaker of the House of Representatives of the Congress of the United States Carl Albert has declared: We must congratulate each person who contributed to this remarkable experiment. The Apollo-Soyuz flight demonstrated the technical expertise of the Soviet Union and the United States, an expertise which is very impressive. The flight attracted the attention of people not only in our two countries but throughout the world. Observing the outstanding accomplishment in space, we cannot help looking optimistically toward the future of Soviet-American relations.

On earth in space the people of our two great countries can gain great benefits by working together on problems the solutions to which can improve the lives of everyone, said another American political figure Senator William Hathaway.

The American Communist newspaper DAILY WORLD comments that the American-Soviet space experiment is more than just a milestone in the exploration of outer space. It is an event of enormous political importance. All mankind view it as a symbol of the relaxation of tension and as proof of the fact that difficulties, however great they appear, can be overcome through fruitful cooperation.

Budapest. There is no necessity of explaining the importance of the fact that the Soviet Union and the United States through their joint space experiment have made a remarkable contribution to world science for purposes of studying as yet unknown phenomena and developing better conditions for life on earth, declares the ESTI HIRLAP. Another Hungarian newspaper -- the NEPSZABADSAG -- emphasizes that this important event goes far beyond the bounds of technical progress. The Soviet-American experiment is of great political importance; it will help to further relax Soviet-American relations, also relations between east and west.

Sofia. The newspaper RABOTNICHESKO DELO comments that the remarkable event in space has justifiably attracted the attention of millions of people and evoked excitement throughout the planet. "This fact," continues the newspaper, "brilliantly and convincingly shows what can be achieved by the human genius when efforts are directed at useful cooperation, when people work together for the good of mankind."

Warsaw. There are events about which one can say from the very beginning with complete conviction that they are historic, that they will forever be included in the treasury of human accomplishments. Just such an event is the flight of the Soyuz and the Apollo, declares the ZIELONY SZTANDAR.

Ulan-Bator. The Soviet-American experimental space flight has demonstrated to the world the broad possibilities of scientific-technical cooperation between two countries, despite the differences between their social-political systems, writes the UNEN. The joint experiment in space, the newspaper emphasizes, is an outstanding event in the exploration of the universe; it is a triumph of Lenin's principals of peaceful co-existence and the Peace Program advocated by the twenty-fourth Congress of the CCCPSU, a triumph of Socialism.

Paris. The newspaper L'HUMANITE calls the joint Soviet-American space experiment a flight which has brought enormous benefits to mankind. The five Soviet and American cosmonauts, the newspaper points out, are returning to earth enriched by unprecedented experience, a sense of strengthened friendship. They are returning with proofs of the value and necessity of scientific cooperation. Their flight is also a priceless testimony of the benefits which peaceful co-existence can yield.

LE FIGARO writes that the actual "star" of the joint Soviet-American crew is the space veteran Aleksey Leonov. "His smiling face, cleverness, and pleasant manners are a joy to all," adds the newspaper.

Rome. The joint flight of the Soviet and American cosmonauts has evoked an interest which has surpassed all expectations, declares PAESE SERA. Millions of people have excitedly followed the experiments of the cosmonauts. After the Soyuz-Apollo flight it will be more difficult for opponents of relaxation to throw monkey-wrenches into relationships between the Soviet Union and the United States.

Ottawa. The joint flight of the spaceships Soyuz and Apollo is a brilliant example of putting into action Lenin's principles of peaceful co-existence among states having different social structures, declared George Harris, one of the leaders of the Combined Trade Union of Electricians, Radio Technicians, and Mechanics of Canada. The working class of the Capitalist countries welcomes the Soviet-American experiment, because it opens up new prospects for the relaxation of international tension and the

strengthening of peace, emphasized Harris. The Canadian Labor Union leader is convinced that the flight of the Soviet and American cosmonauts is also an indication of the growing international prestige of the Soviet Union and a universal acknowledgement of the ideas of co-existence constituting a basic principal of international relations.

New Delhi. The Soviet-American experiment is helping to eliminate the atmosphere of suspicion and mistrust in relationships between countries, declares the INDIAN EXPRESS. Such "relaxation of tension in space" will help to further advance relaxation on earth and the development of mutually beneficial cooperation among all countries of the planet.

Tananarive. "Unprecedented Flight," "A Dream Becomes a Reality," "A New Contribution to the Cause of Peace on Earth," -- these are the headlines concerning the joint Soviet-American space experiment in the MALAGASY PRESS. "The successful and phenomenal flight of the Soviet and American cosmonauts," comments the IMUNGU VAUVAU "will undoubtedly serve to bring all nations closer together. It represents a major contribution to the strenthening of peace." (TASS).

Chronicle of the Day. Reports from the KOMSOMOL'SKAYA PRAVDA EPAS Press Center.

And so, the space voyage has come to an end. Behind it lay years of intensive preparations. The exciting expectation of the launch ... the blastoff ... the meeting in space ... the joint work together ... and the return to earth. We saw it as it happened.

Today you are reading the final dispatch from our Press Center. The work in space is completed, and it is time to think about what we have been watching these past days.

Moscow

Nikolay Orekhov reports from the International Press Center as follows:

"The successful docking of the Soyuz and the Apollo has already become part of history. But the importance of this event is such that journalists will again and again devote pages of reports to it, and they will continue to address many questions to the program directors.

"They will focus attention on Vladimir Sergeyevich Syromyatnikov -- the director of group number three, under whose supervision the radically new androgynous peripheral docking assembly was developed.

ZYCIE WARSZAWY (Poland): We might repeat the question asked by our colleagues in Houston: "Why did your docking assembly work better than the old docking assembly of the Apollo?"

V.S. Syromatnikov: "The new assembly, the fruit of cooperation between Soviet and American specialists, has the following radical advantages over the older type of assemblies. First of all, any ship equipped with such an assembly can play the active or the passive role; second of all, after docking it is not necessary to remove the docking assembly from the inside tunnel."

FRANCE PRESSE (France): "Will the new docking assemblies be mounted on all Salyuts and Soyuzes?"

Answer: "In order to install the new assembly on the Salyut station it will be necessary to modernize it. Naturally, this operation will not be carried out on already existing stations and Soyuzes designed for docking with them. I believe that in the future the new assemblies will be installed on all spaceships but this will be done is a question of time."

258-13-39

During all these days, our telephone practically never stopped ringing. At first we tried to record the telephone calls in order to count them up later, but this turned out to be impossible; if we had been busy with that we could not have answered the questions.

We have printed some of your questions and we have answered the rest. In answering the more complicated questions we have had help from staff members of the Institute of Space Research, for which we wish to thank them on your behalf.

And, naturally, we are grateful to all of you, dear friends, for helping us, for the fact that together with us you watched every day of the space Odyssey.

A Souvenir

A brief dispatch from Chelyabinsk: A medal commemorating the joint flight of the Soviet and American cosmonauts was designed at the Chelyabinsk Art Objects Factory.

A Telegram

One of the final telegrams coming to our Press Center:

"We are excited and happy about the successess of the glorious seven spacemen. We wish for you a safe return to earth! And we report this

fact: Today we poured into our country's grain bins two housand tons of top-grade seeds of the famous bezostaya-1." Agronomist V. Glushkov, on behalf of the agronomy service of Zavety Lenina kolkhoz (Kavkazskiy Rayon, Krasnodarskiy Kray).

While our Press Center was in operation we received 183 telegrams. Some of them you have seen printed in our nespaper. Thanks to all of you, friends!

We are also grateful to those who wrote letters to us. And we were not able to answer all your questions, please do not judge us to harshly: there were simply too many.

Houston

Our special correspondents Yaroslav Golovanov and Anatoliy Manakov report from Houston:

The joint Soyuz and Apollo flight is multi-faceted. In examining the American newspapers and magazines and listening to special television broadcasts which are given several times per day on different programs you can see they do not repeat each other, and that each finds its own viewpoint when commenting on the events in space. But all of them are the same in one way: this flight has truly been an innovative one in terms of politics, representing a specific and substantial example of scientific-technical cooperation. As far as technical innovation is concerned, we could name a great many other technical novelties besides the new docking asembly.

Americans have what they call "Murphy's Law." The name Murphy is strictly symbolic, representing some non-existent Irishman who is suppose to coin truths similar to the aphorisms of our own Koz'ma Prutkov. Well, one of "Murphy's Laws" goes this way: "Anything that can happen sooner or later will happen.." Today when specialists say the problem of rescuing people in space by means of space techniques is a very serious and actual problem, we have to believe them although, fortunately, such actions have never been necessary in the more than fourteen years since man has been in space. Nevertheless, very serious emergencies have developed on occasion, and the rescue problem was not merely thought up by some visionary dreamer; rather, it derives from actual space flight experience.

Let us recall several facts. In March of 1966 the American ship Gemini-8 went out of control, and its crew Neil Armstrong and David Scott made an emergency landing in the Pacific Ocean. Finally, the "most serious emergency since man has been in space," as NASA termed it, was the explosion on board the Apollo-13 on its way to the moon. An emergency system for firing the engine of the transport Apollo was also used by the third crew of the Space Station Skylab in February 1964 [sic].

But in principal, the emergency systems themselves are not guaranteed against failure.

We talked about all of this during a conversation with Doctor Paul Campbell, one of America's leading specialists in the field of aviation and space medicine, who at one time headed all the medical and biological work of NASA. Doctor Campbell maintains constant contact with the leading Soviet specialists in the field. He took part in an International Astronautics Congress in Baku and is known to Soviet readers as the author of a major article in the latest issue of "Nauka i chelovechestevo" [Science and Man].

Doctor Campbell said: "One of the most important results of the EPAS is the brilliantly executed 'dress rehearsal' of a rescue of one spaceship by another ship of a different system, designed in another country. We considered this to be possible, and now it has been proved.

"You represent a youth newspaper, and I should like to share with your young readers one very simple truth, which was revealed to me in my seventieth year of life: "Never predict that something cannot be done. Anything can be done if people are united and headed toward a single goal, if the goal is a noble one and important for mankind ..."

Flight Control Center

Special TASS Correspondent N. Zheleznov had an interview with the project director on the Soviet side, corresponding member of the Academy of Sciences USSR K. Bushuyev. The scientist had this to say:

"On behalf of the directors of all the working groups I should like to express to the friendly group of five cosmonauts and astronauts our acknowledgement of their excellent performance in space, for the accurate execution of the entire program. The Soyuz and Apollo space flight has brilliantly confirmed the correctness of the joint solution of the engineering ideas of the Soviet and American specialists. This will undoubtedly affect the future progress of world science and technology.

"We are extremely gratified by the high praise given to the efforts of the scientists, engineers, and cosmonauts by General Secretary of the CCCPSU L. I. Brezhnev, who called the Soyuz-Apollo space complex a prototype of future international orbital stations."

The Press

The press, radio, and television in different countries of the world have been focusing considerable attention on the joint Soviet-American experiment in space. "The World is Delighted!", "Mankind Welcomes This!" —

These were the headlines common to all newspaper articles, reports, and interviews. We present herewith several quotations from the newspapers:

"How essential the efforts and accuracy were in order to prepare for and accomplish the meeting of the two spaceships in the boundless reaches of the celestial ocean. This fact brilliantly and convincingly demonstrates what can be achieved by the human genius when efforts are directed at useful cooperation." RABOTNICHESKO DELO (Bulgaria).

"Veterans of World War II were excited to receive the news that the docking of the Soviet and American ships was taking place at the very moment when the Soyuz and the Apollo were flying above the Elbe, where in 1945 the Soviet and American soldiers met one another." TRYBUNA LUDU (Poland).

Moscow

Our correspondent at the Moscow Press Center Nikolay Orekhov reports:

"I went to the director of the group of NASA specialists involved in public relations attached to the Soviet Press Center A. Alibrando and asked him to comment on the EPAS stage that had been completed.

"'I believe,' said he, 'that the joint portion of the flight went astonishingly smoothly. This is our shared success, the success of our countries and our technology. It showed that two countries going their individual ways into space and separated by thousands of miles can successfully work together under difficult and trying circumstances. We see now that if people really want to work together they can do it.'

"The loud speaker overhead came on. The flight directors on the American side and the Apollo crew were congratulating their Soviet colleagues on the successful completion of the Soyuz-19 flight and wished them a safe landing."

Telex

We were watching the landing of the Soyuz in our Press Center, when the telex clattered into action with the first telegram:

"To cosmonauts Leonov and Kubasov. The collective of Moscow construction workers in the town of Naberezhnyye Chelny congratulate you on your successful flight. You are great fellows! Glavmosstroy [Main Administration for Housing and Civil EngineeringConstruction in Moscow City] in the city of Naberezhnyye Chelny. Transmitted by Maslova.

Vyazniki

Our correspondent L. Ovchinnikova reports from Vladimirskaya Oblast:

These days, in the hometown of Valeriy Nikolayevich Kubasov the space flight is the subject of slides, photographs, and slogans. The people of Vladimirskaya wished the cosmonauts a successful flight and safe landing. At the hour of the landing hundreds of people came to the city square. There they held a city-wide rally, at which Valeriy Nikolayevich Kubasov's fellow countrymen spoke. The rally was participated in by Valeriy Nikolayevich Kubasov's parents and his sister. We asked Nikolay Ivanovich and Tat'yana Ivanovna Kubasov what message they would like to convey to Valeriy.

Nikolay Ivanovich said:

"Tell him we are very excited. We are waiting for him to come and see us."

Salyut-4

The crew of the Salyut-4 Orbital Station found out about the Soyuz-19 landing from the communication operator of the Control Center.

The cosmonauts got this greeting from earth: "Good morning! Aleksey Leonov and Valeriy Kubasov have landed in the territory of Turgayskaya Oblast. They are in excellent condition. The CCCPSU, the Presidium of the Supreme Soviet USSR, the Council of Ministers USSR have warmly greeted the crew of the Soyuz-19 ship. The greeting also mentioned the successful work of the Salyut Space Station."

The cosmonauts answered:

"Convey our sincere congratulations to Aleksey Leonov and Valeriy Kubasov. We are very glad about the success of our comrades and colleagues. So long until we meet again on earth."

> And so we are closing our Press Center. The events already belong to history. The time has come for analyzing and thinking about the events in space and on earth, to which we have all had the good fortune to be witnesses and participants.

Report from KOMSOMOL'SKAYA PRAVDA Press Center by V. Gubarev and L. Repin.

22 -- July 1975.

The Flight is Completed, The Flight Continues.

Congratulations of Partners

Houston, Flight Control Center, 22 July (Special TASS Correspondent). American astronauts T. Stafford, V. Brand, and D. Slayton are continuing their flight on board the Apollo.

When they received the report about the landing of the Soyuz-19, the American astronaut congratulated their Soviet partners on the joint experiment and the successful completion of the program.

The Apollo crew is continuing to carry out scientific experiments within the framework of their own program. The astronauts have been observing and photographing earth for purposes of studying the geological structures of the American continent, ocean currents, and the condition of the sea, including water and coastal pollution.

Work has begun on measuring the concentration and vertical distribution of aerosols in the stratosphere; this will be taken account of when developing equipment for future spaceships.

There have also been some experiments in the recording of ultra-violet radiation and some biology experiments.

The Apollo spaceship is to splashdown in the Pacific Ocean near the Hawaiian Islands at 0 hours 18 minutes on 25 July Moscow time.

A rescue group headed by the helicopter carrier "New Orleans" is already in the designated landing area.

Okay! Excellent!

Special IZVESTYA Correspondent Bronislav Koltovoy reports from Houston.

Returning from the Press Center in the morning after the Soyuz landing I bought a local newspaper in an automatic machine near my hotel, the HOUSTON CHRONICLE. The headlines in large type on the front page screamed: "Soyuz Landing Okay!"

It was the major event of the day. It was the subject of discussion at a press conference in the Space Center: Only a little later it was reported by all newspapers and commentators on television broadcasts. It was the subject of conversation of Americans in the streets, all the

while making a circle of their thumb and index finger (which is a sign meaning "okay!").

It is easy to understand how difficult it is on such a day to get through to such a person as Doctor George Lowe, one of the NASA directors, or the the director of the Johnson Space Center Doctor Christopher Kraft. But both of them were especially considerate of the request of the Soviet journalists to have a meeting. The respect with which they deal with their Soviet colleagues was clearly extended to us as well.

At the appointed hour a high speed elevator in the Administration Building delivered us to the ninth floor, where the offices of the top administrators of NASA and the Houston Center are located. The harried secretary asked us to wait a minute. We examined the walls of the reception room. Our eyes were attracted by a memorial plaque. It read: "In Memory of Yuriy Gagarin, the First Man in Space. 12 April 1961.

"From the Astronauts of the United States of America.

"J. Glenn, on behalf of the astronauts of the Mercury Program.

"J. McDivitt on behalf of the astronauts of the Gemini Program.

"Neil Armstrong, on behalf of the astronauts of the Apollo Program."

First we were received by Doctor Lowe. This skinny, athletic looking man with a tanned face is the technical director of NASA. He took part in the very first negotiations when the general outlines of the EPAS project were just beginning to be sketched. Rushing into the small conference room, he sat at a desk and with a smile looked at us expectantly, waiting for questions.

"We should like to hear evaluation of the importance of the joint flight of the Soyuz and the Apollo spaceships."

"To begin with I'm very glad that our joint scientific program has succeeded so brilliantly. I should like to congratulate, via your newspapers, all the Soviet people who took part in the EPAS project, especially cosmonauts Aleksey Leonov and Valeriy Kubasov. Of course, we still have to be concerned about our own astronauts. But I hope that everything will be successful there also.

"It may be that some time will have to go by before we can fully evaluate all the meaning of this flight. But already we can say that it is not confined to purely technical and scientific results. It is very important that we have learned to cooperate, and this opens up to us excellent prospects for the future.

"I was personally very satisfied in cooperating with your scientists -- the President of the Academy of Sciences Academician M. Keldysh, Academician V. Kotel'nikov, Academician B. Petrov and Professor K. Bushuyev.

We asked Doctor Lowe to give us his opinion on what the future development of cooperation between our two countries in space would be like.

"We discussed this question just two months ago. In principal we are all convinced that the undertaking begun on the Soyuz and Apollo flight must be continued. But all of these so far are just preliminary ideas which must be throughly examined."

"Have you possibly thought of carrying out another flight like this one?"

"The Soyuz and Apollo flight demonstrated that we have learned to work with you to make the ship's atmosphere compatible; we have learned to jointly control their flight from two centers; we have learned to accomplish the docking maneuver. The cosmonauts and the astronauts magnificently performed during the entire joint program. This means that it is already possible and essential to make a new step forward, to prepare a more complicated flight which will bring even greater scientific benefits to both countries."

"Doctor Lowe, you visited us at Baykonur. What was your impression from your trip to the Soviet Space Center?"

"Your Space Port is history itself. After all, it was from there that the world's first man made satellite was launched, also the world's first cosmonaut. That was my main impression."

"How do you evaluate the Soyuz?"

"It meets all of the standards imposed on it for the execution of the Soyuz program tasks. Incidentally, that was brilliantly demonstrated by the joint flight, as well as all previous Soyuz flights.

"Our joint EPAS project," said Doctor Lowe in conclusion, "is a very vital component in the overall cooperation between the Soviet Union and the United States. There are many other spheres in which our countries are making joint efforts. But the thing we have done together with you in space is a truly magnificent step, and I am glad that I took part in accomplishing it."

We said goodby to the eminent veteran of the space programs of the United States. Twenty minutes later we were hurrying to meet an old friend of ours -- the director of the Houston Space Cneter Doctor Christopher Kraft. It was he who was responsible for the development of ths Apollo spaceship and ground tests of its systems, for the training of the astronauts and organization of flight control operations.

On the desk in his office stood the same model of the linked-up Soyuz and Apollo which we had seen here two years ago, when we visited him during the Skylab flight.

Without waiting for questions, Doctor Kraft began to talk to us.

"Speaking frankly, four years ago, when we had just begun to work on the EPAS, we had serious reservations -- we doubted whether we would be able to achieve that which has been so successfully accomplished in recent days. We not only spoke different languages -- we had a different way of thinking. Your space systems and ours were also significantly different. And during the first stages of the joint undertaking, a ten-minute matter would take a day's worth of effort. But then everything went as it should. Meeting each other half-way, we achieved mutual understanding and mutual trust. The success of the past six days of the joint flight has strengthened this feeling of mutual trust. Our engineers have learned to understand not only with their mind but also their heart, that such flights are very beneficial to both countries. And they hope that our cooperation will be continued.

"I had the pleasure of congratulating the staff of the Flight Control Center on a magnificently performed operation. Your administrators have every reason to be proud of your contribution to the implementation of the shared project.

"It must be said that the joint Soyuz and Apollo flight went smoothly in a way that is rare. It was lacking, if one may put it that way, in the surprises which our press so dearly loves. This is an expectable result of the excellent, thorough preparation of the flight on both sides, and I believe that Professor K. Bushuyev is very happy today, as is our own Doctor G. Lanni.

"The Soyuz and Apollo flight is truly a historic event in all respects. But as yet we are only making the first steps in space exploration. It is necessary to begin practical utilization of outer space in the interests of mankind on an even greater scale.

"I hope that your country will continue to actively develop your program. This will spur us on. It promotes useful competition which, in my opinion, must accompany cooperation."

"Doctor Kraft, why did you shut down the Skylab Program, which was directed precisely at the resolution of applied tasks?"

"I can only regret that decision. The Skylab Program, of course, could have yielded many more benefits. But we cannot simultaneously develop two such costly programs as the Skylab and the 'Space Shuttle.'"

"How is the Apollo flight going now?"

"Everything is fine there. The astronauts who have remained behind to work alone in orbit are our best pilots."

We conveyed our wishes to Doctor Kraft for a safe landing of the Apollo in the designated area of the Pacific Ocean, and then we said goodby.

"I hope that we will see you again," said Doctor Kraft. "The flight is coming to an end. But this is just the beginning of our cooperation in space." 22 July.

First Evaluations of the Results.

Report from the Moscow Press Center.

"The Soviet cosmonauts have landed safely. The interest of the army of correspondents has now, as expected, transferred to an evaluation of the joint flight, to its effect on the future activity of man in space."

It was this interest which suffused yesterday's morning press conference, which was participated in by Twice Hero of the Soviet Union USSR Cosmonaut Pilot A. S. Yeliseyev, the director of the joint flight from the Soviet side, the shift flight director V. D. Blagov and the director of the consultation group of the United States and Soviet Flight Control Center Charles Lewis.

"The results of the just-completed joint flight seemed to us to be very important" A. S. Yeliseyev told the journalists, "because they have demonstrated the excellent cooperation between the two control centers. Everything that we mapped out together beforehand has now been tested and practiced. Now we can draw our main conclusion: it is possible to control one joint flight from two control centers. In addition, it has now become clear how to make the ships compatible. And how to utilize the stations of the other country to maintain contact with our own ship and to rescue it in case of emergency. Now, in my opinion, the problem only requires legal formulation, because the technical problems have been solved. In the future, in all liklihood, the rescue of foreign ships will become an international matter, as is true now of civil aviation. It is necessary to arrange for spaceships which meet compatability standards to stand duty ready for launch."

The following question was addressed to Viktor Blagov: "What is going on now in the Moscow Flight Control Center?"

Here is his answer: "Practically speaking, the Moscow Flight Control Center has completed its work. All that remains is a few communication channels with Houston and a small personnel staff to help the American side by means of Soviet tracking stations for the Apollo if the need arises."

"If it were necessary to repeat the flight, what would you do differently?" This question was again addressed to A. S. Yeliseyev.

"Well," answered the flight director, "the cosmonaut's time was about thirty percent taken up by public information tasks -- television reports, movie-taking, and so on. We thought that all of that would be much simpler than the controlling of the ship. But it turned out that both of the crews performed superbly in their navigation and scientific tasks, while the preparation of the movie and television equipment took up more time. I would run the whole photographing program in time. And in addition, we ought to cut down on the amount of on-board paper work."

Many of the people we talked to in the Press Center emphasized that the joint flight had become possible thanks to the policy of relaxation of international tensions being steadfastly conducted by the CCCPSU and the Soviet Government. In this evaluation, both foreign and Soviet journalists were unanimous. Ye. Kubichev, D. Pipko, A. Yurkov (Sotsialisticheskaya Industriya).

The Soviet People Speak.

We Are Proud of Our Heroes

I myself, like all the workers in our shop, was anxiously awaiting the landing of the Soyuz-19 carrying cosmonauts A. Leonov and V. Kubasov. And here they are on earth. A joyful, exciting moment!

The people of our country are especially proud of the Communist Party, for its wise leninist policy of peace. After all, only through the insistent implementation of the principals of peaceful co-existence has it become possible to have this joint flight of Soviet and American cosmonauts. When people combine their efforts in a noble, shared cause, the results are always fruitful. This cannot help but gratify us, and I believe most Americans as well.

Let us hope that in the future even the most ordinary, the most sincere human hopes will become realities, that this epochal Soviet-American experiment in space -- and it is based on the growing scientific-technical and cultural cooperation on earth -- will do more to tip the scales in favor of the active development of mutual understanding and good will in the relations between our great countries!

In this epochal flight there is a share of our labor as well -- workers, regardless of what each of us does. We should like to work even better in order to multiply our country's glory. A. Durnyshev, Milling Machine Operator of Urals Machine Building Plant, Hero of Socialist Labor. Sverdlovska.

An Exciting Day

The people of earth have been anxiously awaiting this banner day on all continents. On 21 July at 13 hours 51 minutes Moscow time the Soyuz-19 landed successfully.

We, students in Siberia, heartily congratulate the scientists, workers, engineers and technicians, and fearless cosmonauts on their successful flight. The peoples of the Soviet Union and America as well as of all countries know very well that the joint experiment in space is more than just a great accomplishment of the technology of our days. It is primarily the result of the peace-loving foreign policy of the Soviet Union, the CCPSU, and the Soviet Government, which have not spared any efforts for the sake of relaxation of international tensions, for the sake of a bright future for all mankind. The joint flight of the Soviet and American cosmonauts has graphically confirmed the realistic possibility and the necessity of combining the efforts of our countries for the sake of strengthening peace on earth, for the future development of technical progress. I. Mertsalova, a student of the Tomsk State University. Tomsk.

A Historic Voyage

I should like to say that the joint flight of the Soyuz and the Apollo spaceships has been viewed as a special occurrence. It is more than merely a routine voyage into space. This flight has constituted an example of peaceful cooperation between two countries in one of the most advanced spheres of science -- the study of space. In addition to our peoples, all mankind is benefiting from the study of the space around our planet, as well as the study of the planet itself.

From the heart we welcome the historic flight of the Soviet cosmonauts and the American astronauts, and we congratulate A. Leonov and V. Kubasov on their safe return to Mother Earth. I. Bednov, Hero of Socialist Labor, Crew of the kolkhoz imeni Voytik. Aleksandrovskiy Rayon, Stavropol'skiy Kray.

The Flight in the Mirror of the World Press.

An Inspirational Example of Cooperation.

Sofia: This is Advantageous to All

The historic meeting and the friendly handshake in space represents a triumph of human reason and for this reason it benefits all peoples, the whole world.

The meeting of the Soviet and American cosmonauts in orbit vivdly reminded me of the joint efforts of Soviet and American pilots during the war with Hitler's Germany. That war was a struggle for peace, and today the cause of peace has won another victory. We are in favor of such meetings, of cooperation, of mutual understanding, and of joint efforts for the sake of peace on earth. Zakhari Zakhariyev, Bulgarian pilot, Hero of the Soviet Union.

Warsaw: Brilliant Coordination

In order to achieve a historic success such as the joint Soyuz-Apollo flight it was necessary to select and train personnel very carefully, to carry out very complicated research efforts, to apply the latest designs and technology, to utilize the best materials, and all of this at a level of highest accuracy.

The Soyuz-Apollo flight has been a symbolic example which strengthens our hopes for progress and a stable peace. Because the concentration of joint efforts and tools of such great powers as the Soviet Union and the United States, without doubt, will help to achieve a rapid and complete understanding of space, and will reveal as yet unknown secrets in different spheres of science and technology. Academician Jan Kaczmarek, Scientific Secretary of the Polish Academy of Sciences.

Tokyo: For the Good of Mankind

From the heart we congratulate the successful rendezvous of the Soyuz and the Apollo in orbit around earth. It is the best proof of the effectiveness of moving away from rivalry toward cooperation in the exploration of outer space.

I should like to express the hope that the joint actions of the Soviet Union and the Unit States will be joined by other countries, and that such friendly interaction will spread to other spheres of practical application of the fruits of scientific-technical progress for the good of all mankind. Tsuyoshi Asanuma, Director of the Institute of Space Research, Tokyo University.

Mexico City: The Success of the Space Epics

This time science and technology have been placed at the service not of hate and destruction but rather brotherhood, peace, and solidarity. We welcome this great accomplishment of our time. And we are confident that it reflects one of the hopes of all nations for the creation of a new, more just, rational, and free society. The Mexican Newspaper EL NACIONAL. (Reports by YZVESTYA Correspondents).

Orbits of Relaxation.

> The successful Soviet-American experiment in space is the direct result of the process of relaxation of international tensions. At the same time it is promoting the further progress of relaxation and the strengthening of mutually beneficial ties among all countries. This is the basic conclusion drawn by eminent sciences, public fighres, and commentators of the world press, in commenting on the results of the Soyuz-Apollo flight and the conclusion of the Soviet part of the joint space flight.

New York. The American newspapers have published the greeting of L.I. Brezhnev, N. V. Podgornyy, and A. N. Kosygin to Soviet cosmonauts and the designers of the Soyuz-19 spaceship -- to everyone involved in making this flight jointly with the American Apollo ship. The leaders of the Soviet Union, says the NEW YORK TIMES, have congratulated the cosmonauts on their successful flight, and they have also praised the superb performance of the American astronauts.

The CHICAGO TRIBUNE writes: "Both for the long-term future and for the near future, the events of recent days in space are of much greater importance for mankind than the landing of the Americans on the moon six years ago. If the Soviet Union and the United States will continue to proceed along the path of space cooperation, the direct benefits from this for the whole world will be truly astonishing."

Warsaw. There is no exaggeration in the claim that by docking their ships, the Soviet and American cosmonauts have opened the doors into a new era, remarks the TRYBUNA LUDU. All of the experiments in space, the whole flight, derived primarily from a new climate in the world, a climate of relaxation in the relations between the Soviet Union and the United States. Without that which we are accustomed to call peaceful cooperation of countries having different social structures, the meeting in space would have been impossible.

Belgrad. The newspaper POLITIKA writes: "the brilliant technical experiment is of multi-faceted political importance. The evolution of relations between the two great powers has been manifested in two directions: the relaxation of tension has made it possible for the joint flight in space, and this latter, in turn, with respect to political and psychological relations has promoted the further strengthening of the atmosphere of relaxation."

London. We warmly congratulate the fearless explorers of space Aleksey Leonov and Valeriy Kubasov on their successful completion of the joint flight together with the Apollo crew, declared the president of the British Society of Interplanetary Communications K. Getlend. They, like all who cooperated in the success of this flight here on earth, have entered a new golden page into the history of man's conquest of space.

Paris. The newspaper L'HUMANITE writes: "Now when the mission of the Soviet Soyuz-19 ship is complete, the flight directors and the specialists will have to draw up the results and draw conclusions and determine the next stages of space exploration on the national and international plane. But we can already say today that the Soyuz-Apollo program and the concluding portion of the flight of the Soviet spaceship testified to the fact that rich experience has been gained."

Bonn. All peace-loving people were able to see with their own eyes what great possibilites are to be found in peaceful cooperation among nations, declared the well known West German public figure and member of the directorate of the German Peace Union I. Weber, commenting on the successful completion of the Soviet portion of the Soyuz-Apollo program. Pursuing further the path of peaceful cooperation, he added, many problems can be resolved through the efforts of different countries. (TASS).

The Beginning of a New Era.

A Dialogue Between Soviet and American Writers, Chingiz Aytmatov and Kurt Vonnegut.

...It is 4 o'clock in the afternoon Eastern Daylight Time in New York. Americans are sitting at their television sets. The Soviet cosmonaut is shaking the hand of an American astronaut. The popular television personality Walter Cronkite will soon say in his news broadcast that this handshake "may be the beginning of a new era in man's venture into the unknown ..."

At that hour the American writer Kurt Vonnegut and the Soviet writer Chingiz Aytmatov have met in front of a television set in New York. Directly in front of the screen they have exchanged the first impressions about this remarkable space experiment.

Aytmatov. We have already become accustomed to unbelievable events involved in the conquest of space. Now we are jaded. We earthlings of today cannot be surprised by anything special. Nevertheless, I believe that in the history of our generation this is an astounding event -- that which we are seeing right now on the television screen.

I recently wrote a story; the events in it relate to a time when practically no one thought of penetrating the depths of the universe. It was war time. People were plowing the earth with horse-drawn plows. Now these same people have witnessed the sucesses of rocket technology, and yet the time interval in history is not a long one.

The story is to some extent autobiographical, as I was attempting to describe what I saw and felt at that time. My youngest son Askar read the story in manuscript and was astonished -- he could hardly believe there were no tractors then. I answered that there were tractors but there were not enough because of the war. Now the scientific-technical revolution as to speak dragged us from one era to another. And what is a tractor today? Here we are sitting at a television set and not merely watching what is taking place in space but, rather so to speak, being

involved in the process of a search by two great powers for points of contact of peaceful cooperation with each other.

This is exciting to me. Outwardly, we are sitting calmly and watching the tenth or twentieth broadcast from space. But this compels us to think about the titanic power of the human mind. I'm sitting and thinking -- knock wood -- and hoping that it will continue this way: no hostility there in space. Let us also hope there will be none on earth.

Vonnegut. That which we are watching is remarkable. Incidentally, in my opinion, the simple fact that I am sitting here with you now speaking in a friendly way deserves high praise. We understand each other perfectly. And even before we met now I was able easily to understand Aytmatov, because he is a writer like me, and we have common interests, common concerns, and common professional secrets. You were just saying that two different countries are meeting now in space. But we met you earlier. You are well acquainted with our literature, and we to some extent know yours. And we met along the Elbe. That was a meeting of enormous importance, finishing the war on the bloody fields of Europe. I was liberated by the Red Army. When our armies met and shook hands, that meeting did not take place at a triumph ceremony -- death and destruction were all around. The war was a terrible calamity, and it must not be romanticized. But it was the first time our peoples met linked in a common goal. And we have now a new -- and how! -- meeting.

As far as I know there has never been any hostility between our peoples. If you stop an ordinary American on the street and ask him whether he hates the Russian he will be surprised: Why should he hate the Russians anyway?!

Of course, there are still some manics raving in our country, but as the saying goes, every family has its black sheep.

Aytmatov. Today in the world there are no conflicts of catastrophic scale: For thirty years now we have managed to avoid a new World War. Nevertheless, there is a great deal that separates us for many reasons -- historical, political, and social. No one claims that we ought to keep, to conserve these conflicts as they are. The goal of life, probably, is to attempt to seek resolutions for particular problems all the time. Such attempts are made in various spheres. One instance of this is what we are doing together with you in literature, in culture, when we attempt to influence the intellectual convergence of peoples, when we encourage the exchange of intellectual values, which can and must promote the development of a noble form of thinking, designed to serve the world's prosperity.

Another instance is that which is taking place now before our very eyes, when your cosmonauts and ours are working like members of a single family to accomplish a single great goal.

Doesn't this meeting represent a significant symbol and a promising beginning? Shouldn't it be followed by the opening up of new prospects for us? Should we not see in it an attempt to find some kind of generalized example of efforts under conditions of the conflicts of life? After all, that which is taking place now before our very eyes is not just a technical accomplishment. I see in it a very important aspect of the moral and ethical relationships between our countries. Let us recall the kind of relationships these were during the post-war period... And here we have together opened a window into space. Through this window into space we can so to speak see each other in another light, in another dimension.

Vonnegut. I think both of our countries thought that they would gain greater power before their enemies ...

Aytmatov. Well, if the source of power were to be sought only in confrontation, then you would have to adopt the boxer's stance all the time. It may be that that would make a country be so-disciplined, intense, and ready to repulse or to attack, but that would not be any kind of life. We must think about the fact that millions of people in such a confrontation would not remain uninvolved, but one way or another would become engaged in the process of tension. They would suffer from this. Humans are only given one life to live. There comes a time when a person attains physical and intellectual maturity, when he must think about things, grasp the world, declare himself, and carry out his purpose. It cannot be right for a man to sacrifice this, to be forced all the time to act like a boxer, to have to beat up someone or be knocked down himself!

Vonnegut. Our civilization must be sufficiently mature to say: Yes, we now have the knowledge to go to the planet Venus. We will be doing that some time. There's no hurry. Venus will not disappear from the sky. Let us be wise rather than acting like scuffling children who want to take the top of a hill from other children. Let us approach our goals step by step and together.

I was amazed at how quickly the Soviet Union recovered from the effects of World War II, and I was amazed its remarkable technology, at its setting the pace in bold scientific undertakings. We have in America a game, football, in which sometimes a player is killed. The American scientist Norbert Wiener wrote that Americans are inclined to interpret problems as games which must be won. But if this is so, the fighting tendency must derive from causes relating to the country's history because no strong enemies have ever attacked it.

We are gradually changing. Cooperation in space is an example of that. But I should like to cite an example from another sphere of life. At present in this country a type of man who is physically strong, muscular, who can crush his enemies is not considered attractive anymore. If someone insults my wife, it is no longer obligatory that I dispatch the insulter to the other world. And if a man is overwhelmed by emotion, no one any longer blames him if he cries. But when I was a boy growing up in Indianapolis, my friends taught me how to look tough on the street. That was the fashion, that was the custom in America. then. Now, there is no need to look like a threat to people around you. I believe our leaders are coming to terms with such changes in the national character. There is no way I want to take the top of the hill away from the Soviet Union. It may be that the next accomplishment will be the discovery of a cure for cancer. It makes no difference to me where the discovery is made: in the Soviet Union or in America.

Naturally, there is a field in which we have to be tough: business. In business negotiations with Soviet representatives I would prepare very carefully. As long as we are sitting together and talking we love one another. But we must be less ingratiating when resolving issues about what quantity of money goes from one hand to another and on what terms.

Aytmatov. I should like to suggest that we gather our thoughts together, otherwise they will wander off like cattle in the hills. I should like to return to the space meetings, to what is taking place at this moment while the world watches. We can approach this broadly from different angles -- historical, social, or daily routine; nevertheless, this is a most important event, filling the newspapers, the airwaves, and all channels of information. Every person will attempt to understand it in his own way, to evaluate it, to view it from his own standpoint, in order to guess what it pesages for the future.

As far as sports are concerned, I personally have a rather calm attitude toward it. I do not think that that aspect of human nature can have a decisive importance on the international plane. I know people who are manics about victory in sports, and if their favorite team loses to another team and gives up first place to another team, they think its a catastrophy. Sports, the spirit of sports, are in the nature of man. I agree. It represents a striving to overcome something, to achieve something, to overtake, to surpass. Of course, the passion for sports stirs up the blood, and people sense life more acutely. But in this case I am concerned with something larger, because there are too many problems on earth, too many conflicts which are considerably more important than sports concepts.

The world is uneasy; there are raging social, national, and other conflicts and passions. History is developing in an unending struggle. And out of this seeming earthly chaos is growing something new today, something which is enhancing mankind in its own eyes. I believe that what is taking place in space now is enhancing all of us in our own eyes, showing what we are capable of. It is the kind of precedent that people in the future will refer to. We will say that there was a moment,

like a burst of light, when the strong powers of the human spirit went to meet one another -- not for destruction but for unity. I have hopes -- very large hopes -- that this event will reflect on many spheres of life, including the development of culture, the thinking of mankind, mankind's perception of various aspects of social life both in individual manifestations and on a global scale. As far as I understand the mood of the Soviet people, this is what interests us most of all. We are all aware that space technology can be used for military purposes. And we do not want them to be used that way. In the collective human mind, evidently, some positive changes are taking place. I would like to believe that.

Yesterday we returned from San Francisco. As we were walking around the city, people hearing us speak Russian looked around; some of them came up to us, said hello, and raised their thumb up in the air: Great things are doing in space there, they seem to say. We understood one another without words. But there have been other people who have doubted whether this venture is worth all of the dollars spent on it.

I do not wish to judge or blame those people who attempt to see everything in terms of money. For them, money in the long run must have some objective, substantial meaning -- whether it be a lipstick, or an automobile, or a skyscraper, or something else. And when this something else is not a thing, then it seems to them that the money is being wasted.

There is no doubt that space exploration requires great material expenditures. This question can hardly fail to concern any person. I noticed this on the first day after I arrived in Washington at the premiere of the play written by myself and Kaltay Mukhamedzhanov entitled "Ascent of Fujiyama" in the Arena Stage Theatre. The people in the audience got excited and agitated when one of the play's heroes, agronomist Dosbergen, was trying to deny the necessity of space exploration. He argued, and they argued, and in the heat of the argument he yelled: "Just give me rain when I need it and take it away when I don't. Otherwise, to hell with space! I don't have anything to plow there or to plant there!" At these words there were murmurs in the audience, but at the next words, spoken by the agronomist's wife, the teacher Almagul', who argued that in order to control climate it is essential to know what goes on around the earth, the audience also responded with understanding and respect. It is a familiar situation -- in the Moscow Sovremennik Theatre this scene is also frequently greeted by a strong audience reaction.

Of course, money spent in space exploration could also be used on something else. But it seems to me that there are some unavoidable super tasks facing human society; unless they are resolved it will be difficult to progress.

Yes, no matter what you or I say, no matter how we discuss it, the inevitable is coming to pass -- the development of science and technology,

the development of humankind advances forward. What will it bring? that's the problem. And our most important task is to give the proper direction to this whole process, a direction of genuine progress and human happiness. (This dialogue was recorded in New York by Gennadiy Gerasimov, Correspondent for APN [Novosti Press Agency] and LG [expansion unknown])

Home!

Special IZVESTYA Correspondent Boris Konovalov reports from Zvezdnyy.

The airplane smoothly taxis up to the crowd of people. The door of the jet airlines opens. Aleksey Leonov and Valeriy Kubasov are smiling at the literally hundreds of summer flowers that have been brought to greet them. The applause roars like a victory salute to the conquerors of space. People are gathered here who, during the historic days of the joint Soyuz-19 and the Apollo flight, which all mankind will always remember, forged that success on the ground -- sitting at control panels in the Control Center. Those who worked hand-in-hand with American specialists for three long years until the launch, who were in charge of the cosmonaut and astronaut training. At the airport are close relatives of the heroes of space, also friends and journalists.

Aleksey Leonov and Valeriy Kubasov walked down the ramp to the chairman of the State Commission. A brief report is given, as at the Space Port. At that time they were reporting that they were ready for the flight. This time they report that they have completed their country's vital mission.

Some time has gone by since then -- the launch was on 15 July, today is 23 July. Eight days in all. Yet cosmonautics have already progressed from one era to another. This is the era of international manned flights. And the people who opened this era are now embraced in a happy throng of people shaking hands, smiling, presenting flowers, greetings, and good wishes. The arms embracing them are the arms of the entire country, so proud of her glorious sons.

The cosmonauts barely manage to answer "Thank you!"

Soon everyone will get in cars. And a long, triumphant procession of cars will head toward Zvezdnyy. The bouquets which were lavished on Aleksey Leonov and Valeriy Kubasov by the greeting crowds will be placed by the cosmonauts at the front of the monument to Yuriy Gagarin. The commander of the Soyuz-19 Aleksey Leonov joined the cosmonauts team with Gagarin. It was Leonov's voice that Gagarin heard from Petropavlovsk-Kamchatskiy as he was leaving the zone of radio visibility from the territory of our country during his first legendary flight (During the current flight the tracking station Petropavlovsk-Kamchatskiy maintained communications with Aleksey Leonov and Valeriy Kubasov). He and Gagarin

dreamed about international space stations. Today that dream is a reality. And silently, without words the cosmonauts report about this to Gagarin as they report every time when they return from that deep ocean, reporting the attainment of a new step on the endless ladder leading to space.

And now again they are surrounded by crowds of people. It would appear that the population of Zvezdnyy has grown enormously in one day, considering all the people greeting the cosmonauts. They hardly manage to greet everyone. The children surrounding their beloved "Uncle Lesha" and his flight companion make it hard for the photographers to work. But what can you do -- the hometown boy has returned from space. Here in Zvezdnyy over the course of fifteen years Aleksey Leonov managed to do something nice for everyone, and it is for this reason that this city of heroes loves him so sincerely and heartily.

Standing at the entrance to the House of Culture is the Chief of Cosmonaut Training Center imeni Yu. Gagarin Airforce Major General G. T. Beregovoy; he opens the meeting. And again the people listening to the speeches of the officials, Aleksey Leonov and Valeriy Kubasov gain an understanding of the magnificence of that which has been accomplished. The first international building in orbit has been created; new docking assemblies have been tested which will make it possible for ships of all countries to come to the aid of each other, or to make business visits; the Soviet and American cosmonauts have for the first time in history shook one another's hands and together worked for the sake of a common human goal, for the sake of peace on earth.

Aleksey Leonov and Valeriy Kubasov are presented with commemorative medals and launch switches.

Let us hope that the command "Launching switch!" will resound many times in the future, opening up the way into space for ships on new international flights. 23 July.

Concluding Orbits of the Apollo.

Special IZVESTYA Correspondent Bronislav Koltovoy reports from Houston.

For two days since saying goodby to the Soyuz-19, the Apollo has been winding loops of orbits around the globe. The astronauts are watching with increasing care to see what kind of weather prevails in the vicinity of the Hawaiian Islands where they are to complete the glorious epic of the EPAS on 25 July. Today Stafford, Slayton, and Brand are completing scientific experiments and observations they were scheduled to do on board the ship.

I headed once more into the lobby of the Houston Flight Control Center, this time to see Doctor Thomas Dzhuli [transliteration], who is in charge of the scientific experiment program on the Apollo.

"We have done some good scientific work together with your cosmonauts," the scientist told me. "I think that especially interesting results will come from the Artificial Solar Eclipse which the two ships carried out. We are anxiously waiting for the photographs of this eclipse, made by the Soyuz crew, to be processed."

Since the ships separated, the Apollo crew has been continuing its scientific work. Astro physical observations and biology experiments have been going on.

The equipment installed on the Apollo for scientific experiments is working normally except for an instrument which records soft X-rays coming from the depths of the galaxy. The instrument will not operate continuously; it is necessary to switch it on for short times. Here on earth it is difficult to figure out what's wrong. "But" says Doctor Dzhuli, "we have got use to this 'stubborn streak' of the instrument and hope that the Apollo will bring something back for the astro-physicists."

In the biology experiments the astronauts are studying three problems. They are studying the effect of heavy nuclei in cosmic rays on living cells.

The astronauts are studying the effect of weightlessness on the vestibular apparatus of fish, observing their behavior in a small aquarium.

"Of the practical experience I will mention the work with the Universal Furnance. In it the astronauts are smelting different materials. We are very interested in finding out how weightlessness might be used to produce alloys which cannot be made under earth conditions, for growing ideal crystals which are so essential in electronics."

And, of course, the Apollo crew is studying our planet. The astronauts have photographed the earth's surface, observed currents in the Gulf of Mexico, registered the water pollution in Chesapeake Bay, and the phenomenan of bioluminescence (water luminescence in the Red Sea). They are also studying anomalies in the gravitational field of the earth. This will make it possible to get a better understanding of the deep structure of the planet. "As you see," said Doctor Dzhuli, "the astronauts have plenty to do. For this reason they are reducing the number of hours of sleep and rest they get. But not at our request: they want to do as much as possible. Incidentally, in this regard both the Soviet and American space teams are alike."

Doctor Dzhuli has been called into the Control Center: the latest contact with the Apollo is being made. I returned from the Press Center. There was already some news from the helicopter carrier "New Orleans," which was now cruising in the vicinity of the splashdown. When the Soyuz landed on the steppes of Kazakhstan, at the same time there was a dress rehearsal going on the Pacific Ocean for the search and rescue of the

Apollo crew. Having learned the details of the Soyuz landing, the director of NASA's rescue service Doctor Donald Stalken [transliteration] had high praise for the actions of his Soviet colleagues. The American rescue team is continuing the rehearsal. It is being participated in by helicopters, divers, and the entire crew of the "New Orleans." They want the final stage of the world's first international space flight to be carried out just as impeccably as all of the preceding ones.

The weather in the designated splashdown area is favorable for the astronauts. Light rains are expectable there, with moderate ocean disturbance. The people, naturally, are somewhat concerned. 23 July.

Letter from New York.

"A Blossoming of Good Feelings."

In this country our cosmonauts are being called by their first names Aleksey and Valeriy. They have been made welcome in every home. When the braking rockets of the Soyuz were fired, in New York the clocks showed 6 hours 51 minutes; in San Francisco the time was 3 hours 51 minutes in the morning. Despite the early hour, many Americans were sitting at their television sets: all of the largest television networks were reporting directly on the return of Aleksey and Valeriy to Mother Earth.

The exhausted Apollo crew, passing at that time over the Pacific Ocean to the south of Japan, was sleeping. When, a little later, Houston woke the astronauts up and informed them of the safe landing of the Soyuz, General Stafford's happy voice aboard the Apollo could be heard: "That's great. Convey to them my congratulations. I'm very glad that everything went okay." Soon millions of Americans added their own congratulations to these.

Soyuz is back on earth. And although the Apollo will remain in space until 25 July, the sense of concern is being replaced by a desire to think about what has happened, to sort out the events of these extraordinary days, which if they have not made people feel any younger at least have made them more cheerful and possibly more relaxed.

"The two-day rendezvous and docking of the Apollo and the Soyuz are being evaluated at the Johnson Space Center as both a diplomatic and an engineering triumph, and this point of view is shared by Thomas Stafford, Donald Slayton, Vance Brand, Aleksey Leonov, and Valeriy Kubasov," writes the WASHINGTON POST. "This flight has raised to new heights the policy of relaxation," comments the NEW YORK POST on the successful landing of the Soyuz. And in the words of Doctor Glenn Lanni, the technical director of the EPAS on the American side, this joint flight represents a "turning point" in terms of its significance.

To the Americans it is obvious that, like the meeting long ago on the Elbe, the handshake in space carries with it the kind of store of human warmth, the kind of potential power, which cannot leave things in their previous accustomed places. "In this extraordinarily rational world the historic experiment with the Soyuz and Apollo is just the beginning of a broad program of joint exploration and joint utilization of space resources for the good of mankind," comments the NEW YORK TIMES. "But this close cooperation in space has another and possibly more important aspect. The past few days have brought a remarkable blossoming of good feelings between the Soviet and American peoples. The television image of the Soviet and American astronauts working together in an atmosphere of friendship and trust at an altitude of 140 miles above the earth inevitably raises the question: Why can't such friendly cooperation become more frequent here on earth?"

You can hear this "why" today in the United States from all kinds of people: Industrialists and physicians, scientists and artists. Everyone is dissatisfied in some way with the state of cooperation between our two countries: If it can be done in space, what is stopping us from handling problems together in other spheres? This is an important and possibly the main result of the joint Soyuz and Apollo flight. By itself it has justified the expenses, the difficulties, and the risk, because it relates to mutual understanding among peoples.

Will it be possible on earth to achieve the same harmony that shown down on us for several days in space? No one at present can give a direct answer to these questions, but the five brave men have helped mankind to believe in what yesterday appeared to be impossible.

"The things people can do when they want to!" exults the Boston newspaper CHRISTIAN SCIENCE MONITOR in regard to the scale of the deed which the cosmonauts and astronauts have done, and calling them "ambassadors to space." Indeed, man can accomplish much, and he is up to practically any task. Leonov and Kubasov, who are already back on earth, and Stafford, Slayton, and Brand, who are still in orbit, have proved this. V. Kobysh, Special IZVESTYA Correspondent. 23 July.

The Flight in the Mirror of the World Press.

A Symbol of Fruitful Cooperation.

> The outstanding Soviet-American experiment of the Soyuz-Apollo program continues to remain at the focus of the attention of the foreign press, which sees in it a symbol of the significant changes that have taken place in today's world. The newspapers emphasize that the peoples of all continents are warmly welcoming the joint flight of the Soyuz and the Apollo spaceships because they see in it evidence of an actual softening of international tensions and the development of fruitful, peaceful cooperation among nations having different structures.

Sofia

The Soyuz-Apollo space experiment, declares Academician Sava Ganovskiy, a deputy to Bulgaria's National Assembly, has become possible thanks to the atmosphere of trust and mutual understanding in relations between the Soviet Union and the United States that has developed in recent years. We may say that the joint flight of the Soviet and American spaceships represents a step toward better international circumstances, toward a strengthening of mutual trust, peace, and cooperation, something which progressive humanity has dreamed about.

Realm

The Soviet-American space experiment has demonstrated the possibility and necessity of cooperation between the world's two most powerful nations in the interest of all mankind, primarily in the interests of establishing trust and peace throughout the world, comments the newspaper UNITA. This experiment, the newspaper adds, was superbly executed and will help to strengthen the foundations of further development of international cooperation for the purposes of strengthening security and peace on earth.

Geneva

"From the Meeting on the Elbe to the Docking of the Soyuz and the Apollo" -- This is the headline in the newspaper TRIBUNE DE LAUSANNE MATIN commenting on the significance of the Soviet-American space experiment. Thirty years later, the newspaper writes, the Allies of the last war have repeated the historic handshake, this time in space.

New Delhi

The joint Soviet-American experiment in space has become a triumph of human reason and knowledge, writes the New Delhi newspaper JAN YUG [transliteration]. It demonstrates the prospects being opened up to the world by the process of relaxation of tensions and the development of relations of cooperation and mutual understanding between countries.

Cairo

The successful conclusion of the Soyuz-Apollo experimental program is the main subject in the chronicle of international events in the Cairo Press.

The Egyptians view the joint Soviet-American experiment in space as a brilliant result of many years of research work on the part of scientists, engineers, and workers in the two countries, as an outstanding achievement of space science; this was stated to the YZVESTYA Correspondent in Cairo

by the Chairman of the National Council of Peace Advocates of Egypt Khaled Mohi ed-Din. But less no important is the political meaning of this experiment. It signals the victory of the ideas of peace, the triumph of the policy of peaceful co-existence, a policy which has been consistently implemented by the Soviet Union. It is convincing proof of the fact that the Soviet Union and the United States, despite the difference in their political systems, can successfully and beneficially cooperate in many fields of endeavor. It continues the path toward new and even bolder scientific-technical experiments for the sake of peace and mankind's well being. (From reports by TASS and YZVESTYA Correspondents).

Before the Return.

TASS Bulletin.

Houston, Flight Control Center, 23 July (Special TASS Correspondent). The joint Soviet-American experiment in space is entering its concluding stage: the American spaceship Apollo is to return to earth on 25 July.

As is well known, the successful landing Soyuz-19 spaceship marked the conclusion of the program on the Soviet side with respect to the Soyuz-Apollo project.

The flight of the Apollo is continuing on its own program. Astronauts T. Stafford, D. Slayton, and V. Brand are carrying out astronomy, medicine, biology, and other scientific experiments. They are photographing different regions of the earth's surface.

A press conference at the Flight Control Center announced that the crew of the ship is in excellent condition.

Houston, Flight Control Center, 24 July. (Special TASS Correspondent).

The joint Soviet-American space experiment is coming to an end. The Apollo is to splashdown in the vicinity of the Hawaiian Islands at 0 hours 18 minutes Moscow time on 25 July. At a press conference the shift director of the joint flight on the American side F. Littleton announced that the crew of the Apollo was ready for the concluding stage of the flight and splashdown.

T. Stafford, V. Brand,and D. Slayton separated the docking module from the command module and then executed a maneuver to change the orbit. These operations were carried out successfully.

The crew has carried out a series of scientific experiments making use of the separated docking module. The astronauts continued to observe

different sections of the earth's surface. They examined the on-board equipment in connection with the upcoming splashdown.

The Apollo in Flight.

The Apollo crew's working days in space were filled with scientific experiments. Stafford, Brand, and Slayton are continuing to carry out scheduled investigations -- in particular, visual observation of the earth's landscape, photographing of individual sections of the earth for purposes of cartography, the study of the behavior of fish under conditions of weightlessness, and a number of other scientific experiments.

Flying over the Himalayas, Slayton spent six minutes photographing that mountainous region. Photographs made from space will help cartographers to plot what is known as a stereoscopic map. As a result it will be able to select exact locations for building dams to prevent valleys being flooded.

Observing the deserts, the astronauts focused their attention on the differing colors of the dunes. Changing colors it is believed, indicate different ages: red predominates in the coloring of the older formations. The results will help specialists to study the question of the development of deserts.

"We are so busy that we don't have to rest," said Thomas Stafford today in a conversation with the Houston Space Center. "We have to keep watch over our fish farm, and the ocean currents, and the desert."

People at the Space Center are happy with the work of the astronauts. The Center's director Christopher Kraft had this say about the Apollo crew:

"I selected this crew myself. All of my hopes have been realized. It is the best crew in the history of American spaceflights. Stafford is one of the most experienced and capable of our cosmonauts. In addition to the qualities that are required for piloting a spaceship he possesses as well the traits of an organizer. This has been a great help to us. Slayton has been involved for ten years with problems of cosmonaut training and has now shown that this work has not been without results. Brand is an extremely capable young cosmonaut. He has a future ahead of him. I am convinced that he will go on future spaceflights."
B. Strel'nekov, Special PRAVDA Correspondent. Houston, 23 July.

For the Sake of Human Happiness.

Aleksey Leonov and Valeriy Kubasov Tell About the First International Space Expedition in the Press Center.

And so, the space watch at the Moscow Press Center is coming to an end. We recall that only recently here, on the third floor of the Hotel Inturist, at the first press conference dealing with the outcoming Soyuz-Apollo flight, one of the first questions asked by correspondents was this: "When will we have a chance to meet the Soviet cosmonauts?" Such a meeting was promised to us. And now today, 24 July, the Moscow Press Center will have the long-awaited "docking" with the Soyuz-19 crew.

One of the curious features of the joint Soyyuz and Apollo flight was the fact that the long-distance radio and television meetings between the cosmonauts and journalists were planned beforehand, like scientific experiments, and the "skymen" themselves frequently served as commentators. During these meetings with the press, very complicated systems of space communications were put into action; they used up rather lavishly the precious (precious from the standpoint of time and facilities) minutes of the joint space flight. This was a manisfestation of the huge political importance of the EPAS, its active and impressive role in the matter of relaxation of international circumstances. Peace on earth is today being established in space orbits.

Using the terminology which journalists in recent days have managed to get use to, it is possible to say that all "on-board systems" of the Press Center "have been working normally." Since early morning the spot lights and telephone and teletype lines have been prepared and rechecked. Central television has provided a direct relay of the press conference. Long before it began all of the places in the elegant conference room of the Press Center, decorated with two EPAS emblems -- the Soviet and American versions -- have been taken. The journalists stood up to greet their dear guests Aleksey Leonov and Valeriy Kubasov and welcomed them with prolonged applause.

The meeting was opened by the director of the Press Center V. Sofinskiy.

The press conference is being participated in by the Acting President of the Academy of Sciences USSR Academician V. Kotel'nikov, the Chairman of the Interkosmos Council of the Academy of Sciences USSR Academician B. Petrov, the technical director of the EPAS project on the Soviet side corresponding member of the Academy of Sciences USSR K. Bushuyev, the director of Soviet cosmonaut's training Twice Hero of the Soviet Union Air Force Lieutenant General V. Shatalov. The press conference is also being participated in by the backup crew of the Soyuz-19, cosmonaut pilots and twice heroes of the Soviet Union A. Filipchenko and N. Rukavishnikov.

In the presidium we can see the personal representative of the director of NASA Doctor V. Shapley.

The first to speak to the journalists is Academician V. Kotel'nikov congratulating A. Leonov and V. Kubasov on the brilliant performance of their assigned mission and their safe return to earth, and wishing the same kind of successful conclusion to the flight of the Apollo crew, and conveying to that crew his warmest words of greeting, he said that the joint flight would be long discussed in the press by scientists and engineers. Much work is ahead with respect to analyzing the results obtained. That already today it is possible to draw some conclusions. The successful docking of the ships and the exchange visits of the cosmonauts confirmed the correctness of the technical decisions worked out and implemented in creative cooperation between the Soviet and American scientists and designers. The complex of joint experiments was successfully carried out, in addition to investigations planned for the independent flihgt of the Soyuz-19.

Our country is implementing a broad program of international cooperation in the study and exploration of space together with countries of the Socialist Commonwealth, India,France, and others.

The current overall improvement in the international situation and the improved Soviet-American relations as a whole have promoted the development of Soviet-American cooperation in space exploration, in carrying out a project of such complexity and scale as the EPAS. The carrying out of the flight according to the Soyuz-Apollo project represents the culmination of the labor of many thousands of people both in the Soviet Union and the United States. There is no doubt that this flight will go down in history as a most important contribution to the exploration of space for peaceful purposes, in the interests of all mankind.

Then it was the turn ofcorresponding member of the Academy of Sciences USSR K. Bushuyev to speak.

"The event which we all have anxiously awaited for many months of intensive work has come to pass. This concludes the unique Soviet-American experiment during the course of which, for the first time in the history of space navigation in earth orbit we developed and operated for two days a space system which consisted of two docked vehicles carrying an international crew.

"The world community and eminenet political figures of different countries view this event as the beginning of new international joint flights, as an event which makes an important contribution to improved Soviet-American relations and an improvement in the whole international climate.

"In our approach to this task we resolved many complicated scientific-technical and simple human problems. And we proved that a sincere striving toward cooperation is capable of overcoming even difficult barriers," remarked K. Bushuyev. "In a relatively short time after the

signing of the agreement to do this work we held many meetings of working groups of United States and Soviet specialists; we carried out jointly developed tests and training sessions. We solved a large number of organizational and technical problems.

"We must also not fail to mention the outstanding work of the Soviet and American Control Centers, which impeccably carried out the entire process of flight control. The Centers operated precisely and harmoniously at all stages of the flight."

In conclusion K. Bushuyev said that the accumulated experience of cooperation and the organizational forms that were developed will create an excellent foundation for the future development of all contacts between Soviet and American scientists and specialists in the exploration and utilization of outer space for peaceful purposes.

Then it was the turn of Lieutenant General Twice Hero of the Soviet Union V. Shatalov to speak:

I am especially pleased to remark, he said, that the Soyuz crew performed confidently, very precisely, and accurately; they demonstrated high professional preparedness and excellent knowledge of the equipment and great expertise in the control of the spaceship and its systems, also in carrying out the scientific experiments and in making the television reports which we all witnessed together.

Of course, in this a great deal of credit goes primarily to the crew itself, but considerable credit also goes, of course, to those who took part in the training of the crew for carrying out mankind's first international space flight.

I should like to mention that Soviet cosmonautics, having focused considerable attention on the preparations and carrying out of history's first experimental Apollo-Soyuz flight, is at the same time continuing with unflagging attention to implement our national program. Even now, the crew of the orbital Salyut-4 Space Station -- Petr Klimuk and Vitaliy Sevast'yanov -- is continuing to work in space. The simultaneous successful implementation of two complicated space programs testifies to the maturity of Soviet cosmonautics.

Then the floor was turned over to the Soyuz-19 commander Twice Hero of the Soviet Union Major General A. Leonov. He spoke in Russian and translated his speech into English himself:

"I don't believe it is necessary to list everything we did in space. I know that during our flight the journalists were working hard, and you all know about our flight.

"Everything went -- all of these operations went 'as smooth as a peeled egg'; here I am using a favorite expression of Tom Stafford. The Apollo is suppose to fly eleven more hours before landing. Valeriy Kubasov and

I, as members of the flying crew, and permit me to include in it that the participants of this press conference, wish for the crew of the Apollo spaceship a successful conclusion of the program and a happy landing. We hope that we will soon have the opportunity to see the American astronauts.

"In the Soviet Press," continued A. Leonov, "they have published a message from the leaders of our party and the government to the participants of the space flight in the Soyuz-Apollo program and to those who prepared it. All of their words are precious. But one is especially precious to our crew. It is written that the crew performed its job in accordance with the Soyuz-Apollo program. This is very high priase for our work. It means that the entire complex involving the earth and the spaceship operated impeccably. It means that there was complete understanding between the people on earth and those on the ship.

"And the fact that our performance merited the evaluation 'impeccable' reflects a great deal of credit on A. Filipchenko and N. Rukavishnikov as well, who flew aboard the Soyuz-16 in a program very similar to ours.

"For this reason today I want to say thanks to Anatoliy and Kolya for their work in space.

"Before the flight I thought a great deal about the work that faced us and I looked for weak spots -- anything that might make a problem for us. And it seemed to me that the problem was language. I can now say one thing -- the problem of Russian or English did not come up. We had no interpreters there. That means that we did not have any problems in linguistic."

Then the floor was turned over to the flight engineer of the Soyuz-19 Twice Hero of the Soviet Union V. Kubasov:

"A few words about the docking. It went impeccably both in the passive and during the active operation of the docking assembly on the Soyuz. But during the second maneuver, when the docking assembly of the Soyuz played the active role, at the moment of docking the ship began to shake. Undoubtedly you saw this shaking on television. It did not constitute any danger for the docking assemblies of the two ships.

"We were greatly impressed," continues V. Kubasov, "by the 'artificial solar eclipse' experiment. During this experiment the Apollo was suppose to block out the sun and we were to photograph it. Ar right when the Apollo began to move away from us saw an unusually beautiful pattern of the sun's corona. But to this picture was added bursts of the engines of the Apollo, which operated to stabalize the ship, and also later on there was background illumination from the Apollo's large antenna. It may be that these phenomena that developed during the experiment will to some extent spoil the picture that we got. But we hope that during the first stage of this experiment everything was excellent and good data will be obtained."

Then the press center's guests answered numerous questions asked by journalists.

If we were to attempt to group all of the questions with which the journalists "attacked" the cosmonauts, undoubtedly first place would go to the Social-Political results of the flight, also the new horizons for cooperation which the EPAS opened.

Doctor Shapley, remarking that the flight program, which would come to a conclusion today after the splashdown of the Apollo, was carried out brilliantly, emphasized that future joint operations will depend on steps which will be undertaken by the Soviet Union and the United States. But in addition in carrying out technical projects our countries must expand and develop mutual political understanding.

The polticial results of the joint flight were formulated by Aleksey Leonov. He emphasized that in the success of the joint flight a major role was played by the fact that during the preparations for it the American astronauts came to know the Soviet Union, the life of the Soviet people, and the Soviet cosmonauts had learned a great deal about the American people, their way of life, their customs, and habits.

A. Leonov continued: I believe that Soviet and American people have more in common than they have differences. Our countries have different social systems. Nevertheless, we have found brilliant opportunities for cooperation in one of the most complicated spheres of human endeavor -- space exploration. I believe that our countries will find ways to expand cooperation and in other spheres as well. As Comrade L. I. Brezhnev has stated, we are in favor of cooperation in all spheres."

Academician V. Kotel'nikov, answering a question about the possibility of limiting the arms race, emphasized in this case there could be joint efforts to make more rapid progress in the sphere of scientific research and to provide mankind with many new useful discoveries, a great deal of new thing to make life on earth better. This idea was backed up by Doctor Shapley. In his opinion, resources saved as a result of limiting arms as well as improved mutual understanding between the Soviet Union and the United States would make it possible to substantially expand the exploration of outer space. A. Krivopalov, M. Rostarchuk.

Historic Mission Successfully Completed.

TASS Bulletin.

Houston, Flight Control Center, 25 July (Special TASS Correspondent). The first joint space flight in the history of mankind has been successfully completed involving the Soviet cosmonauts and the American

astronauts in the Soyuz-Apollo program. The American spaceship Apollo carrying astronauts T. Stafford, V. Brand, and D. Slayton on board today at 0 hours 18 minutes Moscow time safely splashed down in the Pacific Ocean about 600 kilometers west of the Hawaiian Islands.

The final phase of the Soyuz-Apollo experiment -- the Apollo's splashdown -- which was executed just as smoothly as the earlier soft landing of the Soyuz-19, which was completed several days earlier.

United States President G. Ford telephoned his congratulations to the Apollo crew on their successful completion of the historic mission. The just-completed flight, he emphasized, opens up a new stage in international cooperation in the exploration of outer space.

A message to President G. Ford from General Secretary of the CCCPSU L.I. Brezhnev was received with great satisfaction. In his message L.I. Brezhnev congratulated the President, the people of the United States, astronauts T. Stafford, V. Brand, D. Slayton, and American scientists, designers, specialists, and the workers on the successful mission of the joint Soviet-American space flight.

Specialists of the Flight Control Center received congratulations from Moscow from their Soviet colleagues. At a press conference held in the Control Center the director of NASA James Fletcher congratulated the American astronauts, the Soviet cosmonauts, and the group of Soviet and American specialists on the brilliant conclusion of the space experiment.

The significance of the Soyuz-Apollo project is extremely great, emphasized NASA's director. The experiment showed that two countries having different social systems can harmoniously cooperate to achieve common goals. Through this joint flight in space we showed to all skeptics that there is a genuine possibility for international unity. In my opinion, added J. Fletcher, we must make use of this opportunity and continue to expand our efforts in more intensive cooperation on earth and in space.

The flight director on the American side Pete Frank declared at the press conference that the cooperation and mutual understanding demonstrated during the course of the flight by the Soviet and American cosmonauts and technical specialists had exceeded all expectations. He expressed special thanks to the Moscow Flight Control Center for their precise and impeccable work.

Astronauts Back on Earth, Condition Excellent!

"The main thing is that they are safe and sound and back on earth!" This was stated by the NBC television commentator with a sigh of relief after the television screens showed that the ocean waves were rocking the Apollo, surrounded by a dense ring of divers.

Yesterday at 17 hours 14 minutes New York time (it was nightime already in Moscow), the television cameras "escorted" the descending Apollo to the landing site. The shipped seemed to stand still on the television screen, three parachutes burst from it, and after that it began to float gently toward the surface of the ocean.

The aircraft carrier "New Orleans" which had been cruising for several days in the region headed toward the splashdown site, and helicopters taking off from it began to drop divers with rubber boats. Inside of an hour the three astronauts, smooth-shaven and unbelievably fresh looking, stood on the deck of the aircraft carrier and listened by telephone to the congratulations from the United States President G. Ford.

Nine days of flight, which included the historic docking of the Soyuz and the two-day merging of the two crews had come to an end. But the faces of Stafford, Slayton, and Brand still showed something which clearly indicated that they were still out there in space, that earth was yet to be grasped.

...On the final day of the flight they were awakened by a folk song which begins with the words "I was born in Oklahoma..." General Stafford, an Oklahoman himself, couldn't help reacting: "You sure know how to wake up a guy," he said. Laughter broke out in Houston Center. The astronauts also became cheeful. Their good mood was also to be seen during the routine "celestial" press conference held the day before. On that occasion, Donald Slayton made everyone laugh.

As everyone knows, many years ago after he had become an astronaut they found a defect in his heart. For sixteen years Slayton argued that he was completely healthy. Now, having flown in space at the age of fifty-one, he was the oldest of any people who had been in space. During the final "celestial" press conference the journalists asked Slayton whether it wasn't too difficult. He evidently decided to pay them back for ancient insults. He reacted immediately: "I didn't have to do anything that couldn't have been done just as well by my grandmother in Wisconsin who is ninety-one years old."

General Stafford, during his turn, did not pass up the opportunity once more to so to speak "put in their place" those people who just before the flight were spreading alarm in the United States, arguing that the Soyuz was not up to this joint effort, that the Soviet Union was not able to guarantee the flight's safety. He emphasized that the American and Soviet engineers, astronauts, and cosmonauts worked in close cooperation and had an excellent knowledge of what both teams were doing, that the Russians were "investing considerable sums in space research"; he also mentioned specially the fact that the Soyuz looked "solid as a rock" in orbit and that the Flight Control wnet impeccably. "Apparently the Apollo-Soyuz flight attracted the kind of attention which some people didn't like," added Stafford, without naming the names either of Senator Proxmire or other loud-mouthed critics of the EPAS.

That was day before yesterday. And now these three are on the deck of the "New Orleans," and everyone is very gratified about it, including Leonov and Kubasov, who sent heartfelt congratulations. The next on the schedule is a reception in the White House and other fully deserved honors. And then a meeting with their brothers from the Soyuz, but this time on earth rather than in space.

The epic flight is concluded. Ahead lie new projects, and they will inevitably be on a larger scale. This one, however, will never be forgotten; it will always be special in our memory. And we will never forget the names of the three Americans, the bold astronauts, and the wonderful people whom we came to know closely during these nine days and during the three preceding years. V. Kobysh, special IZVESTYA Correspondent. New York.

From the Stellar Ocean to the Pacific Ocean.

On the night of 24 and 25 July the lights have gone on once more in the main room of the Soviet Control Center of the experimental Soyuz-Apollo flight. On the enormous map of the world there is the yellow trajectory with a single blue dot representing the Apollo. This is the final orbit of the American ship around the earth, the 138th. On a screen to the right the following words have lit up: "The command module of the Apollo is to splashdown 555 kilometers west of Honolulu" (the capital city of Hawaii in the Pacfic Ocean). On the line of the trajectory of the flight at that location is a white dot representing the finish, and next to it a silhouette of a ship. It is the aircraft carrier "New Orleans" carrying more than six hundred people as a welcoming committee.

The electronic board rpaidly flickers with digits showing the time remaining to splashdown.

The Houston Control Center reports that the Apollo has fired the braking engine, which burned for the designated time, and the ship has gone into descent trajectory. The map shows that this took place somewhere over the Indian Ocean between Antarctica and Australia. The astronauts report that everything is okay on board the ship. Now it is necessary to wait for the ship's compartments to separate, and then to open the parachutes.

Here in the Moscow Center the place is crowded. Only the operations floor is deserted -- the rows of control panels are unoccupied. Everyone is sitting on the balcony in front of the television screen which is showing the entire epic of the Apollo splashdown. Despite the late hour, in attendance are the following people: President of the Academy Sciences USSR Academician V. Kotel'nikov, the chairman of the Interkosmos Council of the Academy of Sciences USSR Academician B. Petrov, the technical director of the EPAS on the Soviet side corresponding member of the Academy of Sciences USSR K. Bushuyev, Twice Heroes of the

Soviet Union A. Leonov, V. Kubasov, A. Filipchenko, and N. Rukavishnikov, and other Soviet cosmonauts, designers, engineers, and specialists of the Control Center.

Recently everyone here experienced the moments of the landing of the Soyuz-19, and now of the Apollo. Seven minutes remain until splashdown. From the deck of the aircraft carrier "New Orleans" rise the helicopters of the search and rescue group; on the screen appears a dim white star -- the Apollo. Gradually it grows in size. At an altitude of about 4 kilometers the three parachutes burst open. Our Soyuz descends using one parachute, but a longer distance from a height of about 6 or 8 kilometers. Right next to the earth our soft landing engines go on. The Apollo has a harder splashdown. We can see the the descent vehicle, looking like a gigantic automobile headlight, hit the water with its broad "bottom" and turn over. Then the astronauts had to suffer a few unpleasant moments and hang upside down in their straps until the center of gravity is changed and the vehicle is turned over. The ocean is rocking -- not a very pleasant situation. The helicopters drop a whole platoon of aqualung divers with inflatable boats and a ponton which they bring up under the now normally-positioned Apollo

The aircraft carrier slowly and calmly approaches the Apollo and lifts the descent vehicle up onto a side platform. It is almost 1 o'clock in the morning Moscow time. Yes, it takes the astronauts a long time to get out of the descent vehicle. With us it takes literally a few minutes, whereas in this case it takes about an hour. Finally, the happy and smiling Thomas Stafford comes out of the vehicle, followed by Donald Slayton and Vance Brand.

Our cosmonauts send warm congratulations to the American crew. K. Bushuyev congratulates the American project director G. Lanni by direct line, and Academician B. Petrov adds his good wishes.

And the screen shows a triumphant ceremony of reunion on board the helicopter carrier "New Orleans." The flight is over. The final period has been placed at the end of the accomplishment of the historic Soyuz-Apollo project. B. Konovalov, Special IZVESTYA Correspondent. Soviet Flight Control Center, Kaliningrad, Moskovskaya Oblast.

CHAPTER 5 FOR THE SAKE OF PEACE AND PROGRESS

Flight Into the Future.

By Academician B. Petrov, Hero of Socialist Labor, Chairman of the Interkosmos Council of the Academy of Sciences USSR.

Man's venture into space is natural and expectable. Following his conquest of the continents and the vast oceans mankind inevitably had to begin to invade space. For in the life of mankind that environment plays no smaller role than the water and air environments.

With the launch of the first satellite and the flight of Yuriy Gargarin mankind began a new era in history -- the era of the exploration of outer space, of which the best minds had long dreamed. And now an important new step in space exploration has been made before our very eyes.

The development of compatible facilities for rendezvous and docking of spaceships pursues the humanitarian goal of improving the safety of space flights. Mutual help in space, the building of international orbital stations, and the replacement of crews are all impossible without reliable and tested compatible means for docking spaceships. Now this stage has been reached in the joint flight of the Soyuz-19 and the Apollo; the groundwork has been laid for the construction of standardized docking assemblies for the space fleets of any country.

The greeting sent by Comrades L. Brezhnev, V. Podgornyy and A. Kosygin "To the scientists, designers, engineers, technicians and workers, and all the collectives and organizations taking part in the pareparation and implementation of the flight of the Soviet spaceship Soyuz-1i together with the United States spaceship Apollo, and to Soviet cosmonauts comrades Aleksey Arkhipovich Leonov and Valeriy Nikolayevich Kubasov," we read:

The flight of the spaceships of the Soviet Union and the United States represents a significant step in the development of Soviet-American scientific-technical cooperation. Its successful execution opens up new prospects for joint operations by different countries in the peaceful exploration of outer space."

The exploration of space is an undertaking for all mankind. With each passing year an increasing number of countries go into space orbit, and the Soviet Union, which made it the first step on that path, is always ready to extend a hand for peaceful cooperation. Within the framework of the interkosmos program thirteen satellites have already been launched carrying equipment provided by the countries of the Socialist Commonwealth. Space cooperation is developing successfully with France. Recently a Soviet rocket carried the first Indian satellite into space. These days the whole world has witnessed the realization of the joint Soviet-American Soyuz-Apollo project. Steadily and systematically our country is seeing to it that space becomes an arena of peaceful cooperation among all countries.

The joint Soyuz-19 and Apollo flight coincided with the operation of a second expedition on board the Soviet orbital stations Salyut-4. For two months now cosmonauts P. Klimuk and V. Sevast'yanov have been carring out a vast complex of scientific experiments in space as well as observations for national economy purposes. The photographing of vast territories of the country, which they have regularly carried out, represents a great value for geology, forestry, agriculture, and many other sectors of the national economy. The joint experiments carried out during the flight by A. Leonov and V. Kubasov and the American astronauts T. Stafford, D. Slayton, and V. Brand are also of great importance -- not only scientific but also practical. In particular, they carried out a joint experiment known as "Universal Furnace," which is important for the development of space technology. In time this trend can lead to the development of the production of a large number of valuable materials in space.

In space the manned ships and orbital stations work "hand-in-hand" with automatic satellites. Modern meteorology and communications are today unthinkable without the use of satellites. They are now used for naviagation, public education, research into natural resources, the detection of forest fires, and the prediction of floods. Space technology, which requires advanced achievements in other sectors, in turn make it possible to resolve fundamental scientific tasks and at the same time is increasingly becoming a more economically advantageous sector. It is for this reason that interest in space exploration is growing in all countries of the world.

In its advance forward, mankind is constantly exploring the new; we never rest on our achievements. Mankind utilizes its best strengths and available capabilities; it relies on the best technical advances

in order to carry out scientif research in various spheres of endeavor. in order to expand them.

Space flights have yielded many discoveries and have changed in many ways our ideas about the overall picture of the universe and the planets of the solar system. And we have every reason to believe that we may expect new discoveries along these lines. Orbital stations and interplanetary vehicles represents an ideal platform for fundamental research and the study of the solar system and the earth from space. Right now the Soviet automatic stations Venera-9 and Venera-10 are speeding toward the planet Venus; for more than a year now the satellite Luna-22 has been exploring the moon and the space around the moon. Our country views space exploration as one of the main trends in scientific technical progress.

Speaking to the voters of the Baumanskiy election district in Moscow, General Secretary of the CCCPSU L. I. Brezhnev remarked that now the world has entered a period when it is most vital to consolidate the principles of peaceful co-existence and mutually-beneficial cooperation for everyday practical purposes. One such brilliant undertaking is the joint flight of the Soyuz-19 and the Apollo. It opens up wonderful prospects for combining efforts in the peaceful exploration of space for the good of all people on earth.

The Control Strategy.

A. Yeliseyev, Director of the Experimental Flight of the Soyuz and Apollo Ships on the Soviet Side.

For the Control Centers in Moscow and Houston the flight began long before the Soyuz and the Apollo were launched. Neither the Soviet Union nor the United States had any experience in the control of a joint flight from two different control centers; for this reason the flight was preceded by a great amount of preparatory work.

Control of the flight of a spaceship is, in essence, control over the actions the cosmonauts during the flight. Essential information is transmitted to the crew on board, and remote control is exercised on earth over the on-board systems by a command radio line. During the process of flight control it is necessary to resolve a great variety of tasks: to measure the parameters of the ship's motion, to calculate the maneuvers which the cosmonauts must execute to transfer to a new orbit or to rendezvous with another space vehicle, to determine the best conditions for carrying out experiments, to analyze telemetric information concerning the condition of the on-board systems, and to make decisions concerning procedures for further operations. The speed of the flight is very fast, and for this reason all of these tasks must be handled quickly; the actions of the ground-based command-measurement stations and the crew must be carried out at strictly specified times.

In carrying out group space flights the control service must do more than merely ensure the sequence of operations according to the time schedule -- it must also ensure that the ship's crews act in coordination, that the on-board automatic equipment operates in coordination. For this reason, group flights are generally controlled from one place.

We were confronted by a more complicated task -- to exercise control from different control centers separated by great distances. In this case, in order to achieve success, it was necessary for the actions of the ground-based services to be very well coordinated. After all, in order to accomplish docking, for example, or exchange visits by the crew from ship to ship, or to carry out "Artifical Solar Eclipse" experiment, it was necessary for the actions of the cosmonauts and the astronauts to proceed in a definite time sequence and be coordinated together with an accuracy down to one minute and sometimes several seconds. To ensure such coordination it was necessary to work out beforehand an extremely detailed plan of the activities of the crews and ground-based services. But that wasn't all. After all, the flight situation could change and the plan might have to be adjusted.

It was clear that improvisation in such a complicated experiment would be very risky. And long before the launch the control centers had to prepare not only for the scheduled flight program but also preapre in advance for any emergency situations.

First of all the Soviet and American specialists got acquainted with the procedure by which both countries exercised control during ordinary independent flights, and they came to an agreement to maximally retain this procedure during the Soyuz and Apollo flight. It was determined that those decisions with respect to control which did not affect the interests of the other side would be made independently, in accordance with the procedure established in both countries. Control over the process of putting the ships in orbit, moving them to the rendezvous area, preparing the ships for reentry, at the reentry itself was to be exercised in the same way as during independent flights, while informing one another.

It was agreed that control would be exercised jointly on segments where the crews were interacting directly with one another, beginning with the concluding segment of the rendezvous. A minute-by-minute time schedule was formulated for the entire period of the flight, stipulating what the cosmonauts and astronauts were to do at each point in time, what information they were to exchange with one another, how the control centers were to operate, and what information was to be transmitted to one another and when. This schedule was used in the preparation of documents which describe in detail all operations to be executed on each ship. Deviation from these operations was possible only with the consent of both crews and the ground-based services in cases where this was required by changing flight conditions.

The two sides also came to an agreement about the procedure of coordinating changes in the scheduled flight plan itself. A method of interaction was found in which it was possible to make correct decisions in a minimum amount of time. A terminological lexicon was agreed on beforehand. Agreement was also reached on what joint documents would be in the control centers during the flight and how they should be referred to by telephone.

For purposes of simplifying interaction during the flight when time would be in extremely short supply, the two sides examined in advance quite a number of variants of possible changes in the course of the flight and the most likely malfunctions of on-board equipment, and for each case they worked out a procedure for further action.

Thus, for example, the control centers and the crews both had detailed operations plans for a situation in which the Soyuz would be in orbit but the Apollo could not be launched because of weather conditions and our ship would have to wait for one, two, three, or even four more days. The plan also included, for example, what to do if the docking assembly on one of the ships failed to function properly or if the orientation lights which serve as rendezvous beacons failed to go on. Also what to do if one of the compartments of a ship should develop a leak, what to do if the radio equipment should fail, and what to do, finally, if signs of a fire broke out.

In all, more than one hundred emergency situations were examined in advance which would take a great deal of time to resolve unless they were prepared for in plenty of time. As a rule, these were the most complicated situations which had a serious effect on the flight program. But in actuality other less serious complications could also arise. In order to determine the procedures for such situations, the two sides jointly worked out a special document entitled "Regulations on Interaction of the Control Centers." This document specified which situations would allow the crew to make independent decisions and which ones would require the crew to coordinate a decision with the other crew. It also specified which situations would require the decision of one center and which would require the decision of both.

In order to insure that during the flight both sides would be ready at any moment to deal with emergency situations, both of them had to be constantly informed about the ship's condition and the status of operations on board the other side's ship. For this purpose and also for coordination of the decisions between the control centers they installed two television and eleven direct telephone channels, and they also provided for the exchange of teletype and phototelegraph information.

In order to get a better understanding of problems developing on the other side's ship and the abilities of the ground-based services to handle these problems, the control centers exchanged consultation groups

for the flight period. These groups included the most qualified specialists experienced in flight control and on-board systems. The Soviet and American consultation groups had direct communications with their own control centers and received all essential information from there.

Starting in March 1975 both of the centers began flight control training sessions. For the most part they were independent, each side preparing to control its own ship. In addition, joint training sessions were held at the two centers in March, May, and at the end of June, with the participation of the flight crews, in order to practice the interaction. During that time both of the control centers made full scale simulations of actual flight conditions. All communication channels between the two centers were operational. Working models of the Soyuz and the Apollo were operating in the Soviet Union and the United States under laboratory conditions; they transmitted a full volume of telemetric information. The computer complexes of the centers processed this information and sent it to the visual display equipment. Cosmonauts and astronauts were sitting in the model ship's capsule using actual operating equipment. They worked in accordance with the program of the upcoming flight. Voice communication was established between the cosmonauts and the astronauts as well as between the crews and the control centers. The control services analyzed the incoming telemetric information and reports of the crews and made decisions by the same procedures as would be used during the flight.

During the training sessions all stages of the flight were carefully rehearsed. In this, the especially difficult segments such as the docking maneuver, exchange visits, undocking, the "Ultra-Violet Absorption" experiment, and the reentry from orbit were rehearsed many times. These training sessions made it possible to detect and eliminate trouble spots in the paper work and in the flight plan itself, also malfunctions in the technical equipment and organizational shortcomings.

The Soyuz-19 flight was successfully completed on 21 July. It took place strictly according to schedule, and it sometimes seemed as if we had worked this program many times. Of course, we did have some emergencies -- hardly any flight can ever come off without them. On the Soviet ship there was a malfunction in the television system; on the American there was a malfunction with the docking assembly. During the first measurement we did not get the desired results in the "Ultra-Violet Absorption" experiment, and we and the Americans had to change our procedures during the flight. It turned out that we had not had training for either of these situations. Nevertheless, all the decisions necessary were made quickly and correctly, because the personnel of both of the centers had learned beforehand how to operate cooly in difficult situations. The crews performed magnificently during the flight and demonstrated their high professional mastery. The personnel of the ground-based stations and tracking ships also performed excellently, despite the fact that they had to carry a double load: they were not only handling the

international flight but also at the same time they were working with the Salyut-4 orbital station. Thanks to this overall harmonious, accurate work in space and on earth we can now conclude the flight with the standard and routine-sounding phrase: "The program has been fully completed.'

The success of this first international manned flight has depended not only on the selfless labor of the Soyuz and Apollo ship's crews and all ground-based services but also the enormous preparatory work.

An Atmosphere of Harmony.

K. Bushuyev, Corresponding Member of the Academy of Sciences USSR and Technical Director of the Soyuz-Apollo Project on the Soviet Side.

The reentry vehicle of the Soyuz-19 spaceship successfully landed in the designated area on 21 July. On 25 July the reentry vehicle of the Apollo spaceship will splashdown in the Pacific Ocean. The final period will be placed at the end of the Soyuz-Apollo project. The finish line of the Soyuz is the conclusion of a major stage of work on the part of Soviet and American specialists engaged in space exploration.

Exploration of the problems of carrying out joint flights by ships of different countries was begun by Soviet and American specialists in October of 1970, and was conducted at first within the framework of cooperation between the Academy of Sciences USSR and NASA. On 24 May 1972 an agreement was signed in Moscow between the Soviet Union and the United States concerning cooperation in the exploration and utilization of outer space for peaceful purposes. One of the points in this agreement involved the project of the Soyuz and Apollo joint experimental flight.

The range of problems involved in the compatability of the spaceships was rather broad. For effective interaction between ships of different kinds it was necessary to ensure the capability of rendezvousing them and docking them in orbit, direct exchange visits by crews between ships, the execution of a number of dynamic operations after the docking, the coordinated control of ships in flight, communications between the crews, and so on. Each one of these tasks are rather complicated, and when you consider that the manned ships of the Soviet Union and the United States had substantial differences, solving them constituted a serious scientific-technical problem.

Five working groups were created to draw up the project. The first was involved in the design of the ship, the interaction between the control centers, the flight program, the training of the crews and the ground-based personnel ballistics, and scientific experiments; the second group was responsible for the ship's control systems; the third group was responsible for the docking assemblies and their automation; the fourth

group was responsible for the radio equipments, communication equipment, and television; and the fifth group was responsible for the life-support systems. The groups were not at first so well defined as they are now, and they were partially transformed during the project's implementation. The sub-dividing of the project into several "sub-problems" proved to be worthwhile, although it required high organization accuracy in carrying out the work.

From the very beginning three documents were drawn up, jokingly known as the three "whales"; these formed the basis for our project. The primary one was the "Organizational Plan," which defined as far as in advance as possible all the precise norms of the joint relations and norms of the work's organization which must be complied with in the future. The second document was called "Technical Proposals." It was essentially the main project material. It formulated the technical aspects of the project and mapped out the problems which would have to be worked on. This document was expanded and supplemented as the work progressed. The third "whale" was the "Schedule Plan," which strictly regulated the course of all of the operations and their sequence in time; moreover, a document known as the "Schedule Plan for the First and Second Level" was drawn up. The first of these was a comprehensive and consolidated schedule of operations for the project as a whole, while the second dealt with the individual sections -- for example, the docking device.

At first there was a natural "adjustment period" and there was some suspiciousness between the two sides -- it was not clear whether we would understand one another well enough or whether we speak the same technical language. But during our first meetings the "ice was broken," and we came to work in an atmosphere of mutual understanding. We never tried to drive one another into a corner, rather we found ways to compromise -- despite the fact that situations sometimes became complicated.

For example, when the question arose as to the compatability of the ship's atmospheres, it could have presented a deadlock for the whole project. It became clear that if the ships each maintained their original atmospheres -- we use a oxygen-nitrogen atmosphere with a normal earth pressure of 760 millimeters mercury column while the Americans use a pure oxygen atmosphere with a pressure of 260 millimeters -- then even the use of a transfer compartment would not make it possible to allow the cosmonauts to pass from ships to ship quickly. For example, in passing from the Soyuz to the Apollo the crew would have to sit in the passage module for from two to eight hours in order to allow the nitrogen to be removed from the blood "the so-called desaturation process." It was obvious for rescue operation in space, for a ship which had got into trouble, such a procedure would not work. It appeared that for reasons of efficiency the thing to do was to adpot our ship's atmosphere, which is close in pressure and composition to ordinary earth air; the cosmonauts are accustomed to it and it is more fireproof. Incidentally, in the future it will undoubtedly be standard for all manned ships. But if for this

project the American side had to convert from its own pressure of 260 millimeters mercury column to our pressure of 760, this would require substantial strengthening of its structure and great additional costs and time.

If we were to convert to the more rarefied atmosphere of the Apollo, our Soyuz would not have to be re-designed. But this would require that we once again run through the entire experimental testing of equipment that already had been tested many times for conditions of reduced pressure and increased oxygen content.

As you can see, both sides had their own substantial reasons. And any dispute could have lasted a long time. We carefully thought through everything and asked the medical men to select a "compromise atmosphere" which would not require the desaturation process and would make it possible for the cosmonauts to pass from one ship to another quickly. Lengthy experimental work made it possible to find such a pressure -- 520 millimeters mercury column on the Soyuz ship while maintaining 260 millimeters on the Apollo. This ratio makes it possible to avoid a lengthy desaturation process.

Less dramatic but more complicated was the work involved in developing the androgynous docking assembly. The docking assemblies used prior to that on the Soyuz and Apollo ships did not meet the requirements of compatability, and neither of them could be used for the Soyuz and Apollo program. It was decided to develop a new docking assembly of what was known as the androgynous peripheral type. Both sides focused a great deal of attention on this work, knowing that such a docking assembly could become a prototype for docking assemblies of future international stations. Both sides did a lot of experimental testing of the new docking assemblies.

In 1973 the United States carried out operational testing of full-scale modelds of the new American and Soviet docking assemblies on a specially-made dynamic test stand. During August and September of last year the docking assemblies successfully passed their joint qualification tests, certification of their design and evaluation of their performance capabilities under severe flight conditions. In Moscow the Institute of Space Research Academy of Sciences USSR ran through a control docking of the operational docking assemblies.

Considering the enormous importance of ensuring the safety of history's first international flight. we conducted a large complex of not only ground tests but also flying tests. In particular, we made two launches of the modified Soyuz ship on unmanned flights (in April and August of 1974).

In accordance with the program of preparations for the experimental Soyuz-Apollo joint flight, on 2 December 1974 the Soyuz-16 was placed in orbit carrying a crew made up of the ship's commander Colonel Filipchenko

and Flight Engineer N. Rukavishnikov. The Soyuz-16 was similar to the ship which was to take part in the Soviet-American experiment. Its flight program called for the operation of all on-board systems and the work of the crew and the ground-based complex under conditions maximally similar to the conditions of the joint Soyuz and Apollo flight. For example, during the flight they tested and confirmed the operational performance of the docking assembly and the automation of the control in simulating the ring frame of the Apollo, by means of a special technological ring. The crew tested the functional capability of the on-board systems under all atomspheric parameters adopted for the joint flight in the ship's compartments. They also checked the functional capability of the modified system for controlling motion and a number of components of the joint equipment (light beacons, on-board lights, and the docking target).

And so the joint portion of the Soyuz-19 and the Apollo flight is over. We can with satisfaction remark that all of the assigned tasks were sucessfully carried out. A. Leonov and V. Kubasov on the Soyuz-19 and T. Stafford, D. Slayton, and V. Brand on the Apollo performed splendidly despite a few unforeseen difficulties and they demonstrated high-class spaceship piloting. Mention should be made of the smooth operations of the control centers and the excellent interaction during the flight, the superb functioning of the complicated communication system, in which ground-based and satellites took part.

On the whole, the Soyuz-Apollo project has made it possible to accumulate valuable experience in the organization of cooperation on an international scale while carrying out large scale efforts in the exploration and utilization of outer space. We developed a certain style of work -- businesslike and trustful. We were impressed by the ability of the American specilaists to quickly and carefully calculate the benefits of any particular proposal, their persistent striving to resolve any issue large or small quickly and thoroughly, without leaving any loose ends. While thoroughly relying on basic written documents, we were able to resolve many issues by telephone and then confirm the verbal discussion with a written document. We talked by telephone with the technical direcotr of the project on the American side Doctor G. Lanni once every two weeks, and once every week during the pre-launch period. This kind of organization was very helpful under conditions which the working groups were located on different continents.

In one of his speeches, NASA Director D. Fletcher compared the realization of the Soyuz-Apollo project with the successful climbing of a mountain peak from which we can see new horizons of Soviet-American technical cooperation. In my opinion, this is a very accurate comparison. The joint operation was beneficial to both sides. It was the first broad exchange of information in the field of manned flights, and it brought many benefits to the specialists of both countries. The success of the project convincingly proves that the organizational experience of

our cooperation in one of the most complicated sectors can be utilized as well as carrying out other joint scientific-technical projects.

Our bilateral experience in cooperation in the field of space technology can be used in future international cooperation. I am convinced that the exploration of space will become an international undertaking for all of our planet, for all countries, because by its very essence space research is international in character. Konstantin Eduardovich Tsiolkovskiy, the founder of cosmonautics, wrote as follows about space exploration: "...Mankind is acquiring a vast ocean, presented to him as if on purpose in order to bind people together into a single whole, into a single family ..." And now we have witnessed how space exploration is truly beginning to bring the peoples of our planet closer together.

The Docking of the Ships.

V. Syromyatnikov, Candidate of Technical Sciences, Director of the Working Group on Docking Equipment on the Soyuz-Apollo Project.

Sometime during the middle of efforts on the experimental Soyuz-Apollo project -- EPAS -- people sometimes devised a humorous test for beginning staff members: What's the difference between EPAS and APAS? The similarity of these two abbreviations is accidental, but it does make some sense.

In addition to the docking module, which was developed by American specialists in order to make possible the passage from the pure oxygen atmosphere of the Apollo to the normal atmosphere of the Soyuz, the APAS [androgynous peripheral docking unit] is one system on both ships which was developed from scratch, specially for the EPAS. Another reason for developing the docking module was the necessity of installing the docking assembly on it. After all, installing such a unit on the command-service module of the Apollo, which was designed for a docking device made in accordance with the old, tried-and-true "pin and cone" type, was simply impossible unless the entire ship were to be radically re-designed.

Designers of both countries, starting practically "from scratch," drew up a unified technical project. The new units for both ships were constructed in accordance with a unified schematic diagram -- an overall concept, as the Americans call it. This diagram, agreed on at the end of 1971 at a Moscow meeting of specialists after mutual consultations and a study of the different alternatives, specified that the units must be androgynous (that is, capable of both the active and the passive role) and, in addition, peripheral -- that is, with a free central portion where the passage tunnel between the ships would be located.

The docking unit consists of two basic parts -- the docking mechanism and the ring frame. The mechanism "dampens" the shock when the ships come together, couples them, aligns them, and tightens them until the docking

ringframes are touching; these are then sufficiently firm and tightly connected to each other. Compression on the face of them seals the joint. This forms the passage tunnel between the two ships.

The development of the docking unit for the Soyuz-Apollo project was made easier by the fact that it was based on the design of the ringframe used for the Soyuz-Salyut system, developed by our country's specialists at the end of the 1960-s. The ringframe with the mechanisms arranged on it was designed successfully and efficiently. The American specialists liked it, and they proposed that it be used in developing the new device.

A very important and complicated component of the unit consists of the latches for linking up and sealing the joint. When the hatches of the passage tunnel are open, internal pressure tries to burst the joint. To prevent this from happening it is necessary to have highly reliable latches. The safety and even the life of the members of both crews depend on this reliability. It was for very good reasons that even the technical directors of the project kept the development of this component of the design under their own control.

As will be noticed, at all times we are dealing with a general pattern. Why is this? Because in the structures of the docking units of the Soyuz and Apollo there is not a single identical part. In addition, their operating principal is also quite different. For example, shock absorption on the Soyuz is taken care of by electro-mechanical means; on the Apollo this is done hydraulically.

How do the units interact with one another? This has been achieved thanks to the fact that interacting components have been agreed upon; they are arranged symmetrically with respect to the access of reverse symmetry. The docking device has about 1,500 unique parts and assemblies in it. Practically the same number of blueprints si required for manufacturing them.

The current experimental fiight represents the culmination of an enormous amount of labor on the part of engineers, scientists, technicians, and workers of the two countries, who have created and manufactured devices for bringing ships together and docking them; when construction of them first began no one even thought that they would be meeting in outer space in the mid-1970-s. But the purpose of the joint efforts of the specialists is not confined just to the fact that it has helped to facilitate the meeting of two crews in space. This work has resulted in the creation of prototype systems which will make it possible to dock ships in the future both for the purposes of carrying out scientific and technical tasks and for providing rescue service in space if the need arises.

Space Navigators.

Professor I. Bazhinov, Doctor of Technical Sciences, Deputy Flight Director for Ballistics.

Preparations for the rendezvous of the ships in space and the mapping out of their route in space began in parallel with the planning of the entire experiment. At that time the ballistic experts of the Soviet Union and the United States, going on the characteristics of the carrier rockets and the Soyuz and Apollo ships, selected the orbit in which the meeting should take place (this is often called the link-up orbit, since that is where ships dock and space stations are mounted). Then they calculated the trajectories for putting the ships into initial orbits, the maneuvers that had to be executed by the space vehicles in order to go into link-up orbit, the amount of fuel the rocket engines would need for this, and much else.

As is well known, all of the actions of the ships and their position in space were scheduled beforehand down to the hour and even down to the minute, from blastoff until landing. But all that was by calculations. In actuality, everything takes place somewhat differently. Because of slight deviations in the operation of the control systems, the carrier rockets take the ships into orbits which are somewhat different from the planned orbits. Because of a few inacurracies in procedures, the flight of the spaceships in these orbits is also not in full accordance with the calculations. Finally, the maneuvers themselves are not executed with complete accuracy.

The motion of the vehicles in orbit is very sensitive to the effect of even the slightest deviations. For example, if during the orbital placement the speed exceeds the calculated spped by just 1 meter per second, then at the opposite point of the orbit the altitude of the flight will be approximately 3.5 kilometers higher than the calculated altitude. In addition, this increases by 2 seconds the orbital period, so that the position of the ship after one orbit will differ from the calculated position by more than 15 kilometers. This deviation will increase proportionally to the time of the flight. As a result, by the time of the scheduled rendezvous the vehicles will actually be at a great distance from one another.

In order to ensure rendezvous, it is essential to constantly control the motion of the ships, to be able to predict their further flight, to pinpoint planned maneuvers in plenty of time, and to calculate additional maneuvers.

For purposes of accurately determining the actual orbit of the Soyuz at all stages of its flight, ground-based tracking stations, by means of radar, carry out what are known as navigational measurements. These are made during periods when the ship is located within the range of direct visibility from the station.

The results of the navigation measurements are automatically transmitted to the control center located in the Moscow area, and are submitted to electronic computers. The incoming data concerning the actual motion of the ship at any particular moment of time are generally known as the initial conditions of further flight. The center has a mathematical navigational model by means of which, in accordance with known initial

conditions and a given plan of maneuvering, it is possible to accurately predict the motion of the ship on any segment of the flight.

The mathematical navigational model is extremely complex -- it must take account of forces acting on the ship and numerous factors; it must make use of very complicated procedures. These primarily involve the earth's gravity and the drag effect of the upper layers of the atmosphere. The forces of gravity acting on the ship depend in a complicated way on the region of the earth's surface over which the ship is flying and the altitude of the flight. The actual shape of the earth is remarkably different from a globe, and masses of matter which cause gravity are not distributed evenly. The atmosphere at great altitudes is continuously changing under the effect of a variety of causes: the extent of the sun's activity, the condition of the earth's magnetic field, and the time of the day and the season of the year. In order to consider these basic factors in detail, special mathematical models have been developed for the earth's gravitational field and its atmosphere.

In order to predict the ship's movement, taking account of the maneuvers are executed, another mathematical model is also used. It includes formulas which describe how the ship reacts to commands given to the control system, how its motion changes depending on the amount of time the engine unit operates.

The array of models of the gravitational field and the earth's atmosphere, of methods of calculating the passive motion of the vehicle in orbit, of the mathematical model of the control system in conjunction with the plan of maneuvers all constitute the flight's basic navigational model.

Making use of the navigational model, ballistic specialists can predict and analyze the characteristics of its movement during various stages of the flight. When necessary special procedures can be used to re-calculate the maneuvers. If it is difficult to obtain the necessary values of the characteristics of the movement by means of the planned maneuvers, it is possible to calculate additional ones. The maneuvers compensate for the effect of all of the accumulated errors, and they make it possible to accurately enter the link-up orbit. The processing of the navigational measurements, the forecasting of the movement, and the computing of the parameters of the devised maneuvers are all generally known as navigational calculations; the use of these is known as navigational or ballistic support. It also includes the calculations of maneuvers and descent paths both for purposes of landing at the scheduled end of a flight and, if necessary, an emergency landing. It also includes ballistics data transmitted to the ship for the crew's information and for purposes of carrying out experiments. Naturally, computers are used in executing all these complicated operations.

An especially vital requirement with respect to navigational calculations is reliability. Most of them are duplicated by various procedures in one or two computer centers linked by automated communciations lines to the Flight Control Center and the tracking stations.

The parameters of the planned maneuvers are fed into a special command system, and from it, on command of the flight director, they are fed to the on-board systems; they are simultaneously fed to the cosmonauts. After that the ship is oriented in space automatically or manually; at the required moment the engine unit gives it the necessary burst of speed. After each maneuver the cycle of navigational measurements is repeated and the subsequent maneuvers are revised, and so on.

The navigational support for the Apollo is organized in approximately the same way; the only difference is that American tracking stations and procedures of navigational calculations are used. During the flight the Soviet Control Center transmits to Houston data concerning the actual movement of the Soyuz ship and receives the same data concerning the Apollo. The coordinated work of the navigation complexes also provides the necessary accuracy of maneuver. The successful docking of the Soyuz and Apollo graphically confirms this fact.

Factories in Orbit.

Professor L. Ivanov, Doctor of Physical and Mathematical Sciences, and V. Zemskov, Doctor of Technical Sciences.

In the near future we will witness the creation of factories in earth orbits, designed to produce different materials, chemically active compounds, and items for earth-based machinery and equipment. The founder of theoretical cosmonautics K. E. Tsiolkovskiy wrote in 1928: "Eventually, mankind will build dwellings in space. Men will circle the sun, and the wealth of nations will increase by billions of times."

Such factors of outer space as weightlessness and vacuum either cannot be reproduced under earth conditions (considering the necessary length of time) or else they cost a great deal. Vacuum in space is "pure" because it does not contain many chemically active gases and vapors which cannot be avoided under earth conditions.

Now, consider weightless ness. It is impossible to reproduce it under earth conditions for any length of time. Only in space has it been possible not only to carry out the first technological operations under weightlessness -- welding and smelting of different materials -- but also to begin research into corresponding physical processes. In particular, we have dmonstrated the possibility of creating perfectly uniform metal spheres obtained through the crystallization of metals under weightlessness. These little spheres can be used to make high-precision ball-bearings which in terms of qualities can surpass any that are manufactured in earth technology.

There is a realistic possibility of using weightless ness to produce crystalls of semiconductor compounds of sphereical shape. Such crystals will be used in the electronics industry to develop a new class of semiconductor

instruments. Under weightlessness, easily-evaporatin liquid metal and other materials can be easily deformed by means of weak magnetic fields. This opens the way to the production of ingots of any predetermined shape without crystallizing them in molds as is done on earth. One feature of such ingots is almost the complete abscence of internal stresses and high purity.

In weightlessness, the difference in the specific weights of different substances has no effect. For example, on earth liquid aluminum and hard tungsten unavoidably separate. The tungsten settles to the bottom of a vessel with smelted aluminum. But in weightlessness, if a piece of tungsten is inserted into melted aluminum, it stays in place. This opens up unusual opportunities for the development of what are known as composite materials having particular molded structure shape. Such materials may possess unique electrical acoustic, and other properties that are unobtainable under earth conditions.

It will be possible in space to develop foam metals. These are metals that are filled with gas bubbles. For example, foam steel, which consists of ninety percent gas and ten pe·cent steel. This material will float on water, whereas in toughness it is not inferior to ordinary steel. Such steel can find extensive use in aircraft construction, rocket construction, automotive construction, and other sectors.

These materials form the bases of many electronic apparatuses. Without with them it is impossible to build modern television sets, calculators, and spacecraft control systems ... Large crystalls, brought back to earth, will make it possible to substantially expand the production of many instruments.

Of course, the first space factories will not produce tons of new materials. They will specialize in the production of small quantities of materials having special physical properites, primarily for electronics, radio equipment, and instrument building industries. The development of these sectors is already making it advisable and economically justified to produce materials in orbit.

In the near future, cosmonauts will acquire new specialities -- engineers, technicians, and space production workers. In order to accomplish this, our country and the United States have begun wide-scale research into the possibilities of manufacturing materials in orbit.

This task was the subject of one of the joint experiments -- the "Universal Furnace" within the framework of the Soyuz-Apollo program. During it, Soviet and American specialists investigated the possibility of producing in orbit metal materials made of different components which are different in terms of specific weight. During the joint flight of the Soyuz and the Apollo a special furnace was used to smelt and crystallize an aluminum-tungsten alloy. The same furnace was used to produce monocrystalls of germanium semiconductor with silicon additives. Finally, powdered

aluminum was smelted; this of great interest for the development of future metallurgy processes under conditions of weightlessness.

Preparations for these experiments were participated in by the large scientific collectives of the Soviet Institute of Metallurgy Academy of Sciences USSR and the American Marshall Space Research Center.

At the Request of the Biologists.

Academician N. Dubinin, Lenin Prize Winner.

The first questions that biologists asked about space came even before the beginning of the space era. In 1934 at a conference studying the stratosphere, Soviet scientists talked about the great importance of investigating the effect of space factors on living organisms, and one year later the stratosphere balloon SSSR-1-bis carried experimental fruitflies up above the clouds. This experiment was devised and carried out by the laboratory which the author of these lines supervised at that time.

Later on, biology experiments became an essential part of scientific work carried out on different spaceships. The results that were obtained provided scientists with a rich store of material on the effect of space factors on the life activity of oranisms on different steps of the evolutionary ladder: bacteria and single-cell algae, fungi and higher plants, insects, fish, and mammals. The biology research program carried out during the Soyuz and Apollo flight will expand our knowledge even more.

Scientists are especially interested in weightlessness: On earth it is practically impossible to duplicate it. The prolonged abscence of the force of gravity can cause different deviations from the norm in the growth and development of plants and animals; it can change their heredity. A side effect of weightlessness is that the organism becomes more sensitive to mutagenic (heredity-changing) effects, for example cosmic radiation.

The "Bembryonic development of fish" experiment that was carried out on board the Soyuz-19 by the Soviet cosmonauts has as its purpose that of tracing the direct effect of weightlessness on the development of the eggs of the aquarium fish Danio Rerio. Its relative already had been in space aboard the Soyuz-16. A study was made of the formation of the vestibular apparatus of the young fish. This is the facility by which everything on earth learns "from childhood on" to distinguish up from down. In space these things are absent; this, as it turns out, introduces remarkable changes into the structure of the orientation organ. The goal of the experiment is to find out more deeply and in detail the mechanism of these changes.

The Danio Rerio fish are not fastidious in terms of maintenance or behavior. It is possible to obtain their eggs at any time of the year. This was done, in particular, one day before the launch of the Soyuz-19.

Right up until they were brought aboard the ship, the fertilized eggs were stored at a reduced temperature in order to slow down their development, which proceeded in space -- chiefly in orbit, that is, under conditions of weightlessness.

A. Leonov and V. Kubasov brought back to earth both living young fish and fish that were preserved at the end of the orbital flight -- prior to descent. The specimens will be subjected to anatomical investigation.

"Growth of Micro-Organisms" is studying the effect of weightlessness on the life activity of single-cell organisms. A culture of the "cosmonaut microb" -- ordinary Proteus -- was placed on a semi-liquid nutrient. To it was added an indicator which, under the effect of the products of the life activity of the micro-organism, changes its light yellow color to red. An increase in the colored area indicates the growth and spread of the culture of the Proteus in the nutrient. The instrument has a divided scale plotted on it. Twice a day the cosmonauts made measurements along it recorded the figures in the flight journal. After returning from orbit the investigation will be continued by scientists.

On board the Soyuz-19 the crew also studied the effect of space factors on representatives of the plant kingdom: the single-cell chlamydomonad algae and flowering plants krepis [unidentified] and arabidopsis. The experiment with them was divided into two halves, two alternatives. In the first, the algae and some dry plant seeds made the flight in a quiescent state and only when their return to earth were they placed in conditions favorable to the division of cells and the sprouting of the seeds. The scientists are interested in how their development is effected by the space voyage. In the second variant, the seeds are allowed swell and sprout in orbit -- under weightless ness and other space effect. During the flight the sprouts were fixed, in order to rule out any effect of G-factors when the ship landed. In the laboratory, scientists will compare the development of the organisms in the space and the controlled earth variants and will analyze the frequency of "malfunctions" in the heredity apparatus of the cell.

Previous investigations carried out, in particular, during the Soyuz-16 flight, showed that space factors promote more frequent "malfunctions" of this sort as well as disruptions in the normal course of cellular division. Now it will be necessary to refine and augment these observations.

Two biology experiments are carried out by the Soviet and American cosmonauts jointly. They are: "Microb-Exchange" and "Zone-Forming Fungi." During the first one, the cosmonauts took smears of microbial flora from different parts of the Soyuz and Apollo ships and also from each other. The same kind of smears were taken before the flight and will be taken afterwards. Investigators will compare them and determine how the micro flora changes.

Why is such an analysis being done? In the insulated system of a space-ship, new interrelationships are established between microbs and human

beings. Bacteria which were formerly harmless sometimes become pathogenic in the new environment. The ultimate goal of the experiment is to protect future participants in long space expeditions from an undesirable "degeneration" of microscopic fellow-travellers that were initially harmless.

There are also two experiments dealing with the effect of cosmic particles of high energy on organisms; these experiments are to be carried out by the American crew during the independent flight of the Apollo. They are: a study of the interaction of particles with the human being's eyes retina cells, and an investigation of the effect of heavy ions on the seeds of plants and the eggs of shrimp.

The experiments investigating the biological effect on high-energy particles are also of great importance for future space navigation. These particles, as previous experiments have shown, may bring about cell destruction and heredity degeneration. Some data make it possible to assume that in a flight of many months (for example to Mars) up to ten percent of the cells in a human body could be damaged this way. This would lead to serious consequences -- especially for the nervous system. Are these assumptions true? How can living things be protected from cosmic radiation? These are questions to which the scientists are seeking answers.

All of the investigations listed here within the framework of the Soyuz-Apollo program will make a new contribution to the development of space biology and genetics; they will lay a cornerstone for the new stage of cooperation between scientists of the two countries.

Reality Overtakes Dreams.

During the historic flight, correspondents of LITERATURNAYA GAZETA A. Lepikhov and V. Latyshev had an interview with the deputy technical director of EPAS from the Soviet side V. Timchenko and the deputy director of NASA W. Shapley.

Vladimir Timchenko, Deputy Technical Director of EPAS on the Soviet Side

"When we are talking about a project of such a scale as EPAS, everyone understands that the labor of many thousands of people is invested in it. and I should like to hope that the reader will see beyond the names of the group directors of whom I will speak to sense the enormous amount of work of entire collectives. The docking of the manned spaceships required the provision of a number of basic conditions. First of all, the development of compatible docking units. They had to be versatile.

Why was that? The fact is that any spaceship in the future may find itself in trouble, or else it might find itself having to come to someone's aid. Such a radically new docking unit was developed by the group headed by Candidate of Technical Sciences V. Syromyatnikov.

"Secondly, it was necessary to develop means for the ships to search for each other and rendezvous. 'Active' ship, using radio technical or optical means, had to be able to find the 'passive' ship and approach it and dock. Under the guidance of Candidate of Techical Sciences V. Legostayev, a lecturer at the Moscow Physical-Technical Institute, methods were found for resolving this task -- ways to rendezvous the spaceships.

When the spaceships began to come closer together, radio equipment was used to measure the distance; the angular positions of the ships were determined by means of optical devices. In order to 'see' the spacecraft in the shadow, use was made of special light beacons; at smaller distances use was made of on-board orientation lights. By means of this system the Apollo crew observed the Soyuz from a distance of several hundred kilometers.

Both spaceships took part in the search and rendezvous; this can be done only if the radio complexes on both ships are built on identical principals and their parameters are coordinated. Such a condition is also important in order for the crews to be able to talk to one another. A group of specialists headed by B. Nikitin, an engineer having a lot of practical experience, took direct charge of resolving such tasks. They determined the pattern of radio communications between the ships as well as between the ships and earth, and they tested it for compatibility. Other work which they did involved the broadcasting of television reports from the Soyuz and the Apollo.

"A third condition essential for the successful performance of the flight was to resolve the problem of making the atmosphere of the two spaceships compatible. American specialists developed a special docking module -- a unique lock chamber with a replaceable atmosphere.

"Great attention was also paid to the task of providing for the safety of the joint flight. Under the direct supervision of one of our veterans -- I. Lavrov -- means were developed for controlling the heating conditions of the docking assembly; fireproof clothing was developed for the cosmonauts, and the life-support system was modified.

"American scientists and engineers did a great deal to ensure a successful flight. B. White, Doctor Smiley and Doctor Gay [transliteration], Doctor Smith and Doctor Dietz -- these are the names of just some of the American specialists whose labor deserves high praise. They supervised the American working groups and on an equal basis with their Soviet colleagues share in the success of the flight.

"No less important and complicated was another side of this project -- the organizational side. In particular coordination in the actions of the ground-based services of flight control. The fact is that the Soviet-American space program developed independently of one another. For this reason it was necessary to formulate and adopt unified principals of flight control and then on that basis to develop joint documentation to specify the activity of the corresponding services and organize the exchange of information between the control centers, also -- this was far from being a simple task -- to distribute responsibility among specialists for ordinary and for potential emergency situations. Doctor of Technical Sciences A. Yeliseyev, the flight director on the Soviet side, and his American colleague Doctor P. Frank did everything possible to ensure the impeccable performance of their respective collectives.

"The language barrier was handled for the specialists by means of interpreters who were always on duty in the control center. During communications between the centers, use was generally made of standard terminology; verbal reports were made both in Russian and in English.

"The orbital docking of the ships of two space powers has the first time opened up the possibility as well as for carrying out joint scientific experiments in space. Here is just one of them.

"On 19 July during the undocking of the ships, the Apollo 'blocked out' the sun, and a camera installed on the Soyuz took a photograph of the first 'Man-made' full artificial solar eclipse. What was the purpose of this experiment? The fact is that it is during a full eclipse that the most favorable conditions are created for studying the sun's corona, in which high-energy particles are generated. They come to earth and cause a multitude of geophysical phenomena.

"But a natural solar eclipse is an event that is too rare; for each point on the surface of our planet it happens only once every three hundred years. Moreover, the full-phase of such an eclipse lasts only two or three minutes. So this space experiment is truly unique. A comparison of 'earthly' and 'celestial' observations will make it possible to obtain valuable scientific data concerning the 'life' of the sun's corona.

"We can hardly fail here to mention the man whose ideas gave birth to the development of modern cosmonautics, our own great visionary K.E. Tsiolkovskiy! In July of 1935 he wrote: "What could be more inspirational -- to take possession of the full energy of the sun, which is two billion times greater than that which falls to earth. What could be more splendid -- to find a way out of the cramped corner of our planet, to commune with the vastness of the universe and provide human beings with an escape from corwded earth and the bounds of gravity?!"

Willis Shapley, Deputy Director of NASA

"Mr. Shapley, in your opinion what is the most important result of the first international space flight of the Soyuz and Apollo?"

Undoubtedly the most important is the very fact of the flight, because it has become possible thanks to the prolonged and fruitful cooperation between our countries in the field of space technology. To carry out the flight required several years of joint efforts by many, many specialists. These years of cooperation made it possible for us to achieve better mutual understanding. And not just in the field of space technology. We demonstrated that our equipment is compatible, that it is possilbe for researchers from different countries to work together in space.

"As for the meaning of this flight in terms of the future, much depends here on plans for further cooperation. EPAS was a very important first step, but it is difficult to imagine the entire path until the following steps have been made. I hope that soon after the experiment is completed agreements will be worked out for a second, a third, and subsequent steps which will continue that which has been successfully started by this flight."

" Let us hope that the good beginning will be continued and cooperation in space will develop further. What benefits might it bring?"

"I do not know what specific joint space projects will derive from this flight, but think that it would be quite realistic in the near future to have a joint experiment using "space shuttle" which is now being developed in the United States -- that is, a transport ship cruising regularly between earth and an orbital station. It might be possible to build large international space laboratories with the participation of scientists not only from the two countries but also from other countries. We may also think up something even more interesting.

"The political significance of the flight is very great, but it is not the only significance. In the history of mankind there have not yet been very many space flights. For this reason, each flight inevitably yields some new knowledge which we did not have before.

"In any experiment it is necessary to define the main task. In this flight the main task was the docking of the two different ships; this is a very vital and complicated engineering experiment. Of course, someone who was not involved might say that there was nothing unusual in it. But you may be sure that there is a gigantic difference between a project on paper and an actually operating device, especially under such complex circumstances as space.

"No less important are the scientific experiments carried out on board the first international extraterrestrial laboratory. It is too early yet to draw conclusions as to what specifically these experiments will provide for the scientists of the two countries, but it is perfectly clear that investigators have been given material which simply could not have been obtained otherwise."

"In recent years there has been an increasingly clear trend toward international scientific cooperation. Evidently, this is required by the very nature of modern research, the scale of it, the complexity, and the high cost. Can we view the EPAS project as a consequence of this trend and at the same time an inspirational example?"

"With all my heart I hope that now we are witnessing the first step on a long road, leading toward a noble goal, of Soviet-American cooperation in space. Joint projects can make it possible to share tasks and expenses and, therefore, to more quickly achieve those goals which, working alone, we would take longer to reach. As one of the directors of NASA I am well aware how expensive projects of the Soyuz-Apollo type are. But I also know that the money which we have already spent and will spend in the future on similar scientific-technical experiments is being spent extremely wisely. I hope that this flight will serve as an inspirational example not only for our future cooperation but also in general for the development of international scientific research."

Congratulations on the Success in Space.

Greetings from K. Waldheim

New York, 17 July. (TASS) The General Secretary of the United Nations K. Waldheim has sent warm congratulations to the five brave cosmonauts of the Soyuz and Apollo ships and the Governments of the Soviet Union and the United States in connection with the outstanding achievement of the docking of the two spaceships. Today the world has witnessed a historic moment in the peaceful utilization and exploration of outer space, reads the declaration of the United Nations General Secretary, published here. The docking of the spaceships of the Soviet Union and the United States represents an important milestone in the history of mankind. This achievement, K. Waldheim comments became possible thanks to close cooperation between the United States and the Soviet Union in preparing and organizing the flight of the Apollo and Soyuz spaceships. It serves as a remarkable example of concerted action which can be achieved on the road of accomplishing the greatest achievements of our time.

To General Secretary of the CCCPSU
Comrade L. I. Brezhnev

The World Peace Council warmly congratulates you on the historic achievement of the Soviet and American cosmonauts. This outstanding

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event not only helps in the resolution of enormous tasks in the field of joint scientific research of the two countries but also constitutes graphic evidence of the possibilities of cooperation in securing peace and social progress for all mankind. The World Peace Council congratulates the Soviet and American cosmonauts and wishes for them a successful completion of their program. Secretariat of the World Peace Council.

To the Chairman of the Presidium
of the Supreme Soviet USSR
Nikolay Viktorovich Podgornyy

On the occasion of the successful completion of the Soviet-American space experiment let me convey to Your Excellency on behalf of the Austrian people my sincere congratulations and an expression of profound satisfaction on a magnificent technical accomplishment. Let us hope that this historic scientific cooperation will contribute to overall international cooperation and will help to promote human contacts. Federal President of the Austrian Republic Rudolf Kirchschlaeger.

To the Chairman of the Presidium
of the Supreme Soviet USSR
Mr. Nikolay Podgornyy

On behalf of the people and government of Venezuela I congratulate you and all of the Soviet people on the excellent initiative and the successful space docking today of the Apollo and the Soyuz ships; this signals the union of the awesome technlogical achievements of two great nations of the world.

This outstanding event is not only a firm guarantee of world technological progress but also has special political importance for the joining of all nations of the globe in the search for international mutual understanding and cooperation, which can promote the strengthening of international peace based on justice and humanitarianism, and guarantee the general well-being.

I am certain that the peoples of the Third World and, in particular, the nations of Latin America, have welcomed this exceptional decision of the Soviet Union and the United States as a promising augury of the fact that the striving and right our nations toward the organization of a new international economic order can be realized, an order based on the quality and mutual respect among nations, on appropriate access to technology for purposes of the independent development of the countries of the Third World; also that parity can be achieved between the prices which we are paid for the raw materials we produce and the prices for the equipment, tools of production, and technology which we need. I greet you with profound respect. Carlos Andres Perez, President of Venezuela.

To the Chairman of the Presidium
of the Supreme Soviet USSR
Mr. Nikolay Podgornyy

On the occasion of the historic docking in space of the Soviet and American spaceships I have the pleasure of conveying to you my warm congratulations. This event, which has resulted from cooperation between your two countries, testifies to the great accomplishments which can be achieved by mankind in our time, when people demonstrate a willingness to overcome differences in their ideological concepts or social-political systems.

Expressing the wish that peaceful Soviet-American cooperation will serve all mankind, I beg you, Mr. Chairman, to accept assurances of my highest respect. El Hajj Ahmadou Ahidjo, President of the United Republic of Cameroon.

To General Secretary of the CCCPSU
Mr. L. I. Brezhnev

On behalf of the people of India I warmly congratulate you on the successful docking carried out in space carried by Soviet and American cosmonauts. This exciting achievement represents a realization of the strivings of mankind and symbolizes the possibilities of peaceful cooperation among nations. Let us hope that the brilliant scientific achievements of the Soviet Union and the United States of America will serve the cause of peace and yield benefits to people.
Indira Gandhi.

To General Secretary of the CCCPSU
Leonid Il'ich Brezhnev

Esteemed Secretary:

At the moment of accomplishment of the Soyuz-Apollo mission, which is an impressive demonstration of international good will, cooperation, and success, I should like to congratulate all those who participated in this mission for their farsightedness and bravery.

In the opinion of all Canadians, this meeting in space will for succeeding generations represent a symbol of the desire and capability of mankind to work together along useful and harmonious lines. Pierre Elliot-Trudeau
Prime Minister of Canada.

To the Chairman of the Presidium
of the Supreme Soviet USSR
Mr. Nikolay Podgornyy

I am happy to express my sincerest congratulations to Your Excellency and the brave cosmonauts Aleksey Leonov and Valeriy Kubasov on the

occasion of the docking of the Soyuz and Apollo spaceships.

This historic event is a graphic example of cooperation between the Soviet Union and the United States of America for the sake of peace everywhere and international understanding. Mohammad Reza Pahlavi.

To the Chairman of the Council of Ministers USSR
Mr. A. N. Kosygin

On behalf of the government and people of Pakistan and myself personally please accept heartfelt congratulations on the occasion of the successful docking which was just accomplished in space between the Soyuz and the Apollo ships.

Let me take this occasion to convey my special congratulations to the Soviet and American scientists and specialists who were responsible for this outstanding achievement being made possible. Zulfikar Ali Bhutto, Prime Minister of Pakistan.

To the General Secretary of the CCCPSU
Comrade Leonid Il'ich Brezhnev

To the Chairman of the Presidium
of the Supreme Soviet USSR
Comrade Nikolay Viktorovich Podgornyy

To the Chairman of the Council of Ministers USSR
Aleksey Nikolayevich Kosygin

Dear Comrades!

On behalf of the Central Committee of the Socialist Unity Party of Germany, the State Council, the Council of Ministers, and the people of the German Democratic Republic, we convey heartfelt congratulations to you on the first international space flight of the manned Soyuz-19 and Apollo ships.

Since the time of the launch of the first artificial satellite and the first manned flight in space -- these unforgetable accomplishments of the pioneers of the Soviet Union -- outer space has become an arena of fruitful international cooperation. The joint flight of the Soviet and American cosmonauts represents the culmination of cooperation of the two countries in space exploration.

This success of the space pioneers derives from the outstanding results of the efforts of the Soviet Union to implement a policy of peaceful

co-existence, which opens up new horizons of scientific-technical cooperation between the Soviet Union and the United States, and is directed toward the good of mankind.

We wish you, dear comrades, and all the workers of the USSR new successes in space exploration and further development of the process of relaxation in the interest of peace and security of all nations. Erich Honekker, First Secretary of the Socialist Union Party of Germany. Willi Stoph, Chairman of the State Council of the German Democratic Republic. Horst Sindermann, Chairman of the Council of Ministers of the German Democratic Republic.

To General Secretary of the CCCPSU
Comrade L. I. Brezhnev

To the Chairman of the Presidium
of the Supreme Soviet USSR
Comrade N. V. Podgornyy

To the Chairman of the Council of Ministers USSR
Comrade A. N. Kosygin

In recent days, the workers of the Mongolian People Republic have been watching with deep excitement and enormous satisfaction the course of the accomplishment of the joint flight of the Soviet and American spaceships Soyuz-19 and Apollo.

Permit us on behalf of the Central Committe of the MRP [Mongolian Peoples Revolutionary Party], the government, and the people of the Mongolian Peoples Republic and myself personally to convey to you and, through you, the CCCPSU, the Soviet Government, the fraternal Soviet people, the glorious Soviet space heroes, and the collective of scientists and specialists who took active part in accomplishing the Soyuz-Apollo program, warm greetings and most sincere congratulations in connection with the brilliant achievement of history's first international space experiment. The Mongolian people are sincerely happy and delighted with this truly outstanding scientific achievement, accomplished for the sake of peace and progress for all mankind.

The accomplishment of the joint Soveity-American flight in space, which constitutes an event of historical importance, became possible as a result of the policy of relaxation and the development of peaceful cooperation actively promoted by the Soviet Union and the fraternal countries of Socialism. It demonstrates with new force to all the world that the vital strength of Lenin's principal of peaceful co-existence among countries having different social-political structures, and it opens up broad prospects for fruitful international cooperation in the field of the study and exploration of outer space for peaceful, constructive purposes.

We express our firm conviction that the successful accomplishment of the joint Soyuz-Apollo program signals a new and important milestone in the further expansion of Soviet-American relations and will serve the cause of international relaxation, the strengthening of trust and mutual understanding among countries.

With all our hearts we wish you, dear comrades, and through you the great Soviet people, confidently marching in the Vanguard of world social and scientific-technical progress, new and magnificent success in the building of Communism, in the struggle to secure peace and safety throughout the world. Y. Tsedenbal, First Secretary of the CC MNRP, Chairman of the Presidium of the People's Great Hural. J. Batmonh, Chairman of the Council of Ministers Mongolian Peoples Republic.

To the General Secretary of the CCCPSU
Leonid Brezhnev

To the Chairman of the Presidium
of the Supreme Soviet USSR
Nikolay Podgornyy

To the Chairman of the Council of Ministers USSR
Aleksey Kosygin

The magnificent success of the Soyuz-Apollo experiment, which constitutes a new and remarkable achievement of the Soviet people, has been perceived by the government and people of Algeria as an important contribution to the mastery of science and technology for the interests of mankind. Permit me on behalf of the Revolutionary Council, the Government, and the people of Algeria to convey to you sincere congratulations on this great success, which multiplies the glory of the fraternal Soviet people.

Let me take this opportunity to convey once more to you my best wishes for happiness and prosperity.

With high regards, Houari Moumediene, Chairman of the Revolutionary Council, Chairman of the Council of Ministers of the Algerian Peoples Democratic Republic.

To the Chairman of the Presidium
of the Supreme Soviet USSR
Nikolay V. Podgornyy

We in Liberia with profound satisfaction and genuine pleasure received the joyful news of the successful event in space -- the docking of the American and Soviet spaceships Apollo and Soyuz-19, forming a space

complex which made it possible for the Russian cosmonauts and the American astronauts to exchange visits in space and greet one another in friendly fashion, also to carry out joint experiments of enormous scientific value for mankind. This remarkable accomplishment, undoubtedly, constitutes a confirmation of the correctness of the policy of specific cooperation between American and Soviet scientists, designers, engineers, and cosmonauts, an event which opens up new possibilites in search for scientific knowledge for peaceful purposes. We passionately hope that his form of international cooperation in the field of space technology will find reflection in all spheres of human endeavor, that it will bring together people of good will everywhere, so that the resources of our planet can be used to improve the standard of living and establish and maintain peace and security throughout the world.

On behalf of the government and people of Liberia we send our sincerest congratulations to Your Excellency, the Government, and the people of the Union of Soviet Socialist Republics, and through you to the fearless and brave cosmonauts for their tireless and dedicated servcie to mankind. To mark this outstanding achievement in the sphere of science and technology, the government of Liberia has ordered the issuance of postage stamps for international postal exchange as a sign of evidence of our belief in the importance of means of contact as prerequisites for international cooperation for the sake of mankind's progress and peace throughout the world.

With renewed assurances of my extremely high regard and personal respect,

Yours sincerely, W.R. Tolbert, President of the Republic of Liberia.

To the General Secretary of the CCCPSU
Comrade **Leonid Il'ich Brezhnev**

To the Chairman of the Presidium
of the Supreme Soviet USSR
Comrade Nikolay Viktorovich Podgornyy

To the Chairman of the Council of Ministers USSR
Comrade Aleksey Nikolayevich Kosygin

Dear Comrades!

On behalf of the Central Committee of the Bulgarian Communist Party, the State Council, and the Council of Ministers of the Peoples Republic of Bulgaria, on behalf of all the Bulgarian people and myself personally I send to you, the CCCPSU, the Presidium of the Supreme Soviet USSR, and the Council of Ministers USSR, the fraternal Soviet people our most sincere congratulations on the occasion of the successful accomplishment

of history's first joint Soviet-American space experiment within the Soyuz-Apollo program.

It is with special joy that we congratulate the glorious sons of the Soviet Union -- the conquerors of space Aleksey Arkhipovic Leonov and Valeriy Nikolayevich Kubasov, who jointly with the brave American astronauts of the Apollo Thomas Stafford, Vance Brand, and Donald Slayton for the first time in the development of cosmonautics accomplished the docking of ships belonging to two countries and implemented a complex program of enormous scientific value formulated by Soviet and American scientists, designers, and specialists; they have opened up a new page in the space chronicles of the Twentieth Century.

The Soviet Union was the first to invade space and place all of its achievements in the study and exploration of space at the service of nations, consistently conducting a policy of cooperation with other countries in the utilization of outer space for peaceful purposes. The Leninist foreign policy course of action of the CCCPSU and the Soviet State, the active efforts in implementing the Peace Program adopted by the 24th Congress of the CCCPSU have resulted in a relaxation of tension and improved political climate in the world; they have cleared the way toward broad international scientific-technical cooperation, toward the realization of large--scale projects and experiments. The first American-Soviet expedition opens up new opportunities and prospects not only for further space exploration for peaceful purposes but also for joining on an international basis our scientific knowledge, experience, and efforts in other spheres of science that are vital to mankind.

This outstanding event in the history of cosmonautics and mankind, ratified by the first handshake in space by representatives of two great nations, symbolizes a historic turning point in Soviet-American relations and strengthens belief and hope for their futher improvement and expansion in the interests of peace all over the world, for the good of the nations of our planet.

Together with all the world, the Bulgarian people have with enormous interest and excitement followed the flight of the Soyuz-Apollo space complex and the first international meeting in space; we again feel a justified pride in Soviet science and technology, in the Soviet people, the CCPSU, and the Land of the Soviets -- the Vanguard of social and scientific-technical progress, the standard bearer of peace and friendship among nations.

We wish to you, dear comrades, to the Soviet people and the numerous army of scientists and specialists, who have selflessly given to science their minds, energy, and labor, and to the Soviet cosmonauts -- daring pioneers of space flights, worthy members of the first international space crew -- new successes in accomplishing further great initatives of our time, in strengthening and developing international cooperation -- the foundation and guarantee of mutual understanding among nations, of a firm peace on earth. Todor Zhivkov, First Secretary of the Central Committee of the Bulgarian Communist Party, Chairman of the State Council of the Peoples Republic of Bulgaria; Stanko Todorov, Chairman of the Council of Ministers of the Peoples Republic of Bulgaria.

To the General Secretary of the CCCPSU
Comrade L. I. Brezhnev

To the Chairman of the Presidium
of the Supreme Soviet USSR
Comrade N. V. Podgornyy

To the Chairman of the Council of Ministers USSR
Comrade A. N. Kosygin

Dear Comrades!

On the occasion of the important, historic, successful accomplishment of the joint soviet-American space flight of the Soyuz and Apollo ships, on behalf of the Central Committee of the Hungarian Socialist Workers Party, Presidium and Government of the Hungarian Peoples Republic, the Hungarian people, and myself personally, we sincerely congratulate you, the heroic Soviet cosmonauts Aleksey Leonov and Valeriy Kubasov, and all those who with their skill and efforts contributed to the outstanding success in completing this remarkable scientific program.

Your achievement, which is receiving the acknowledgement of the whole world, is at the same time the great result of Lenin's peace-loving policy of the CCPSU and the Soviet government, the systematic struggle conducted by them to strengthen international security and cooperation.

We sincerely wish that this activity of yours will be crowned by further successes for the good of all mankind, socialism, peace, and progress. Janos Kadar, First Secretary of the Central Committee of the Hungarian Socialist Workers Party; Pal Losonczi, Chairman of the Presidium of the Hungarian Peoples Republic; Gyoergy Lazar, Chairman of the Council of Ministers of the Hungarian Peoples Republic.

To the Chairman of the Presidium
of the Supreme Soviet USSR
Mr. Nikolay Podgornyy

The Grand Duchess and I convey to you our warm congratulations in connection with the success of the brave Soviet cosmonauts, who together with their American colleagues have written a new and glorious page into the history of exploration of outer space.

We are gratified by the friendly cooperation of the two great nations in the interests of scientific progress and especially in the interests of peace throughout the world. Jean, Grand Duke of Luxembourg.

To the Chairman of the Council of Ministers USSR
A. N. Kosygin

On behalf of the government of the Kingdom of the Netherlands I have the great pleasure of congratulating you on your successful experiment --

the docking of the Soyuz and Apollo spaceships. This joint experiment is an inspiring symbol of genuine and peaceful international cooperation. Joop M. Den Uyl Prime Minister of the Netherlands.

To the Chairman of the Council of Ministers USSR
Aleksey Kosygin

Let me express my most sincere congratualtions to Your Excellency and to the brave cosmonauts of the USSR on the occasion of the docking of the spaceship Soyuz and Apollo. This historic success, which constitutes an example of cooperation between the USSR and the United States of America, undoubtedly will serve the cause of peace in the world and international mutual understanding. Amir Abas Hoveyda, Prime Minister of Iran.

To the General Secretary of the CCCPSU
Leonid Il'ich Brezhnev

To the Chairman of the Presidium
of the Supreme Soviet USSR
Nikolay Viktorovich Podgornyy

To the Chairman of the Council of Ministers USSR
Aleksey Nikolayevich Kosygin

Dear Comrades,

It is with great interest and attention that we have followed the joint flight of the Soviet spaceship Soyuz-19 and the American spaceship Apollo, a flight which is an outstanding scientific and technical experiment, marking a new stage in international cooperation for man's exploration of outer space and, at the same time, an event which goes in meaning far beyond bounds of a purely scienfic experiment. The successful joint flight of the two spaceships represents an important step which opens up new prospects, and it confirms the benefits and possibility of cooperation between different countries in the matter of exploring outer space.

With all our hearts we are happy that the spaceship Soyuz-19 successfully completed its flight, which represents a new and outstanding achievement of the Soviet Union in the field of the study and peaceful utilization of space.

On behalf of myself and all the Czechoslovak people we sincerely congratulate you, the entire Soviet nation, and especially the Soviet cosmonauts Aleksey Leonov and Valeriy Kubasov, also the Soviet scientists, designers, engineers, and technicians and workers -- everyone who took

part in the preparation and implementation of the joint flight and the successful accomplishment of this vital program.

At the same time we express confidence that in the future the Soviet people will achieve new successes in the matter of space exploration for the sake of peace and progress for mankind. M. Gustav Husak, General Secretary of the Central Committee of the Communist Party of Czechoslovakia, and President of the Czechoslovak Socialst Republic; Lubomir Strougal, Chairman of the Government of Czechoslovakia.

To the General Secretary of the CCCPSU
L. I. Brezhnev

To the Chairman of the Presidium
of the Supreme Soviet USSR
N. V. Podgornyy

To the Chairman of the Council Ministers USSR
A. N. Kosygin

I am happy to convey to the Your Excellency, to the Government, and to the fraternal people of the USSR the sincere congratulations of the Government and people of Afghanistan on the occasion of the brilliant success achieved during the first joint flight of Soviet and American conquerors of space, as a result of their close and fruitful cooperation.

The space docking of the Soyuz and Apollo ships represents a new step along the path of development of science and technology. Let me express the hope that in the future such joint efforts will serve to establish even greater cooperation and mutual understanding among nations in the interests of mankind and the peaceful exploration of space. Mohammad Daoud, Head of State and Prime Minister of the Republic of Afghanistan.

To the Chairman of the Presidium
of the Supreme Soviet USSR
N. V. Podgornyy

On the occasion of the successful joint experiment in space by the Soviet Union and the United States we convey our sincere congratulations to Your Excellency, also to the cosmonauts and all of those who took part in the accomplishment of this great deed.

The docking of the Soyuz and the Apollo has opened up broad prospects for further scientific research in the field of peaceful utilization of outer space for the good of mankind.

We are sincerely delighted with this great achievement of science and technology in the interests of cooperation between the two countries. Birendra Bir Bikram Shah Dev, King of Nepal.

To Comrade Leonid Il'ich Brezhnev

The docking of the Soyuz and Apollo spaceships has been cause for excitement and delight throughout the world. This achievement in space represents an important contribution to the cause of peace on earth, to peaceful co-existence and cooperation among nations for purposes of speeding up scientific-technical progress. On behalf of the members of the Communist Part of Argentina, and expressing the feelings of all our people, we warmly congratulate the CCCPSU, the Soviet Government, the brave Soviet and American cosmonauts, Soviet scientists, technicians, and workers, who made possible this new and magnificent feat in space. Arnedo Alvarez, General Secretary of the Communist Party of Argentina.

To the General Secretary of the CCCPSU
Leonid Il'ich Brezhnev

The Politburo of the Central Committee of the Communist Party of Venezuela congratulates you, the CCCPSU, and all of the glorious Soviet people, who have launched an undertaking which is of importance to all mankind. The Venezuelan people are proud of this achievement: the docking and joint efforts of the Soviet and American spaceships reflect the achievements of both nations, which have a beneficial effect on the development of peaceful relationships throughout the world. We congratulate the scientific-technical workers and cosmonauts. We are confident that future success in this field will serve to benefit the firm policy of relaxation of tension.

On behalf of the Politburo of the Central Committee of the Communist Party of Venezuela. Gustavo Machado, Chairman of the Party.

To the General Secretary of the CCCPSU
Comrade Leonid Brezhnev

On the occasion of the complete success of the joint Soyuz-Apollo space mission we convey to you the warmest congratulations of the Party of Progress and Socialism.

We welcome this remarkable result of the cooperation between the Soviet Union and the United States as a historic event and a valuable contribution to the strengthening of international relaxation and international peace. It is a great service rendered to all mankind, and particular to the nations who are still struggling for their national liberation.

We express to you our feelings of gratitude and wish for you new successes in the campaign being conducted by the Soviet Union and you personally, dear Comrade Brezhnev, on behalf of the triumph of peaceful co-existence and the final elimination of the threat of war.
Ali Yata, General Secretary of the Party and Socialism of Morocco.

To the General Secretary of the CCCPSU
Leonid Il'ich Brezhnev

We warmly congratulate you on the successful launch and docking of the Soyuz and Apollo spaceships. This is more than just a great victory for mankind in the scientific-technical sphere -- it is primarily a great victory in the implementation of the Peace Program of the CCCPSU for the sake of cooperation among all nations. We sincerely wish for your great success in the campaign for our common undertaking, in the campaign for international relaxation, peace, and socialism.
Knud Jespersen, Chairman of the Communist Party of Denmark.

To the General Secretary of the CCCPSU
Comrade Leonid Il'ich Brezhnev

To the Chairman of the Presidium
of the Supreme Soviet USSR
Comrade Nikolay Viktorovich Podgornyy

To the Chairman of the Council Ministers USSR
Comrade Aleksey Nikolay Kosygin

On behalf of the leadership of the Polish Peoples Republic and the Polish people we convey to you and, through you, to the highest organs of the USSR, also all the Soviet people, our most sincere greetings and best wishes on the occasion of the successful completion of the joint flight of the Soyuz and the Apollo spaceships. Please convey our sincere congratulations and express our acknowledgement to the members of the crew of the spaceship for their heroism and outstanding personal contribution to the implementation of history's first international program of the flights and docking of the spaceships of the Soviet Union and the United States. Please also express our gratitude to the scientists, designers, and workers -- to all those who took part in the preparation and successful conduct of this historic international experiment.

The docking of the spaceships of the Soviet Union and the United States represents an epic event in the history of mankind. The implementation of the first international space flight became possible under conditions

of international relaxation and positive shifts in the relations between the Soviet Union and the United States. The joint Soviet-American space flight opens up new opportunities for the fruitful development of scientific contacts between countries, for further strenthening of international relaxation.

The Polish people, together with all people of good will, with joy watched the symbolic Soviet-American handshake in space with the profound conviction that cooperation between the Soviet Union and the United States in space exploration, as in other spheres, will serve the interest of all people, the strengthening of peace and security. Edward Gierek, First Secretary of the Central Committee of the Polish United Workers Party; Henryk Jablonski, Chairman of the State Council of the Polish Peoples Republic; Piotr Jaroszewicz, Chairman of the Council of Ministers of the Polish Peoples Republic.

To the Central Committee of the CCCPSU

Dear Comrades!

The Central Committee of the Peoples Party of Iran congratulates you on this remarkable event -- the first docking of the Soviet spaceship Soyuz-19 and the American spaceship Apollo.

We are delighted with the successful completion of the difficult Soyuz-Apollo program and were gratified to receive the news of the safe landing of Comrades Aleksey Leonov and Valeriy Kubasov. The successful completion of the Soyuz-Apollo program confirms the fact that the policy of relaxation of tension systematically implemented by CCCPSU is yielding visible results; this will strengthen mutual trust and in this way open up broad prospects for international cooperation for the good of peace and progress.

To the great fraternal party we wish further successes in the implementation of the ambitious peaceful plans for the good of all mankind. Central Committee of the Peoples Party of Iran.

CAPTIONS TO PHOTOGRAPHS IN "HANDSHAKE IN SPACE"

(a) First press conference in Zvezdnyy after "earth docking" of the full complement of the Soviet and American crews preparing for the Soyuz-Apollo program.

(b) They are to test in space a modified Soyuz ship -- a duplicate of the one scheduled to dock with the Apollo.

(c) Pioneers of the Soyuz-Apollo project, cosmonauts Anatoliy Filipchenko (standing) and Nikolay Rukavishnikov.

(d) Final training sessions in Zvezdnyy. Soyuz-16 crew asks final questions of procedures specialists. After that, space will ask the questions.

(e) Twice Heroes of the Soviet Union Anatoliy Filipchenko and Nikolay Rukavishnikov after the successful test flight on board Soyuz-16 became the back-up crew for Aleksey Leonov and Valeriy Kubasov.

(f) The office of Vladimir Il'ich Lenin in the Kremlin -- a place where all Soviet cosmonauts obligatorily visit before flying to the spaceport.

(g) Spaceport Baykonur. Embracing, the cosmonauts and astronauts stand on the launching pad where Gagarin's "We're off!" resounded. Valeriy, Kubasov, Vance Brand, Aleksey Leonov, Thomas Stafford, Donald Slayton will write a new, glorious page in the annals of cosmonautics.

(h) During the time of joint training, Soviet cosmonauts visited the United States four times and the American astronauts visited The Soviet Union three times.

(i) Preparations underway for history's first joint flight of the Soviet and American ships. Aleksey Leonov, Donald Slayton, and Valeriy Kubasov at the control panel of one of the trainers.

(j) During these travels they not only worked but also got acquainted with the Soviet Union and the United States.

(k) Historic launches. Soyuz-19 heads into space. Seven and one half hours later the Apollo was launched.

(l) "Can you make a drawing that will symbolically reflect the meaning of your joint flight?" the journalists asked Aleksey Leonov during a press conference with the crews of the Soyuz-19 and the Apollo, flying linked together in space. "It's difficult to draw quickly in space, but it can be depicted," says Leonov. "Look here!"

(m) The Soyuz. 1 - high-frequency antenna; 2 - running lights; 3 - radio telemetry system antenna; 4 - solar battery panel; 5 - tethering and attitude control engine; 6 - pulse light beacon; 7 - solar-orientation sensor; 8 - radio command link antenna; 9 - reentry vehicle; 10 - FM UHF antenna; 11 - external television camera; 12 - docking target; 13 - guide projection of docking unit; 14 - AM UHF antenna; 15 - orbital module; 16 - optical sight orientation device; 17 - UHF antenna; 18 - heat regulation system radiator; 19 - instrument module; 20 - ion "braking" sensor; 21 - control nozzles; 22 - back-up thrust engine; 23 - main rendezvous-thrust engine; 24 - radio telemetry system antenna.

(n) The Apollo. 25 - fast-opening hatch in side wall of command module; 26 - control engines during reentry; 27 - window; 28 - adapter; 29 - auxiliary engine block; 30 - metric wave band antenna; 31 - cruise engine nozzle; 32 - heat shield on bottom of service module; 33 - heat regulation radiator in life-support system; 34 - service module; 35 - heat regulation radiator in electric power system; 36 - command module; 37 - hatch between ship and docking module; 38 - docking module; 39 - round container of air; 41 - hatch of docking unit; 42 - docking unit.

(o) The crew of history's first international orbital station listens of greetings from Comrade L. I. Brezhnev.

(p) Main room of the Soviet Flight Control Center in Kaliningrad, Moskovskaya Oblast. The voice of earth reaches the cosmonauts from here.

(q) During the days of the legendary joint flight of the Soyuz-Apollo system. Valeriy Kubasov and Vance Brand work on board the Soyuz-19.

(r) American Flight Control Center in Houston. Routine contact with the Apollo.

(s) The magnificent moment of the return of the Soyuz-19. Reentry vehicle approaches earth.

(t) The legendary voyage of the Soyuz-19 is completed. Cosmonauts back on Mother Earth.